CHAPTER 9

ENVIRONMENTAL CONSEQUENCES
DETENTION DAM PLAN

This plan consists of five main elements: (1) constructing a flood detention dam along the North Fork of the American River at river mile 47.2, just downstream from the confluence of the North and Middle Forks of the river near the site of Reclamation's partially constructed multipurpose Auburn Dam; (2) relocating Highway 49 and reinforcing the Ponderosa Way Bridge; (3) reverting flood control operations at Folsom Reservoir to governance under the 1986 Diagram; (4) raising and strengthening 12 miles of levee along the east side of the Sacramento River between the Natomas Cross Canal and the mouth of the American River; and (5) constructing a slurry wall into the core of the Federal and non-Federal levees along both sides of the lower American River.

The top of the detention dam would span the North Fork canyon at elevation 998 (508 feet above the streambed). At this elevation, the dam would be 2,700 feet wide, creating a storage capability of up to 894,000 acre-feet. Flood control releases would be made through 20 gates which would be operated to reduce storage of fairly frequent events and retard the drawdown of large floods to reduce the potential for soil slippage along the canyon walls bounding the 5,400-acre inundation zone. The dam would contain a spillway 540-feet-wide (crest elevation 942 feet) and flip bucket (lip elevation 589 feet) for releases if floods exceeded the dam's storage capacity.

The detention dam has been designed to neither promote nor preclude subsequent expansion of the facility into a multipurpose project providing permanent water storage and related water supply, hydropower, flatwater recreation, and instream flow benefits. Such an expansion would require separate congressional action based on appropriate environmental review of the impacts of permanent water storage in the project area. Expansion of the detention dam to a multipurpose facility is discussed further in chapter 10.

To accommodate the flood control storage pool while maintaining current access across the North and Middle Fork canyons between Placer and El Dorado Counties, this alternative provides for an in-kind replacement of the two-lane Highway 49, which traverses the project area just upstream from the confluence of the North and Middle Forks of the river. At its lowest elevation, this bridge crossing is approximately 100 feet above the streambed at about elevation 600 feet. The highway would thus be subject to inundation that would periodically cut off all travel through the project area. For purposes of the environmental analysis which follows, it is assumed that the replacement highway would be aligned slightly upstream from the existing alignment at an elevation sufficient to clear the maximum height of the flood control pool. However, as discussed below, the actual

alignment of the replacement highway would require completion of a route adoption study by State and Federal highway officials.

Operation of the detention dam would result in infrequently inundating the canyon. When this occurs, the Ponderosa Way Bridge would be flooded. To prevent damage to this structure and to prevent it from being swept off its foundation, the bridge would be modified and stabilized in its present location.

Upon completion of the detention dam, flood control operations at Folsom Reservoir would revert to governance under the 1986 Diagram. Under this diagram, seasonal flood control storage at Folsom would be fixed at 400,000 acre-feet, and flood control releases from the reservoir would be maintained at a maximum of 115,000 cfs.

To optimize system operations, a cutoff wall would be inserted into the core of the Federal and non-Federal levees for approximately 24 miles along both sides of the lower American River.

To optimize protection for the Natomas area, 12 miles of the east levee along the Sacramento River would be raised and stabilized.

The Detention Dam Plan would result in a number of operational and construction impacts, identified below with appropriate mitigation measures to reduce the identified impacts to a "less than significant" level. Following this discussion is a summary of the cumulative and growth-inducing impacts.

OPERATIONAL IMPACTS

The operational impacts of concern in connection with the Detention Dam Plan are those related to the effects on recreation; vegetation and wildlife resources, including threatened and endangered species; cultural resources; and transportation, resulting from periodic storage of floodwaters in the North and Middle Fork canyons in the upper American River project area. In addition, reverting Folsom Reservoir flood control operations to governance under the 1986 Diagram would have beneficial effects for water supply, hydropower, and recreation at Folsom (table 9-1). These operational impacts are evaluated below.

TABLE 9-1

Comparison of Projected Peak Outflows From Folsom Dam for Selected Flood Events

	Alternatives	
	No-Action Alternative 400,000/670,000 115,000 cfs (objective release)	**Detention Dam 400,000 115,000 cfs (objective release)**
5-Year Peak Duration ≥ 25,000	60,000 3 days	60,000 3 days
10-Year Peak Duration ≥ 25,000	90,000 4 days	90,000 4 days
20-Year Peak Duration ≥ 25,000	115,000 5.5 days	115,000 5.5 days
50-Year Peak Duration ≥ 25,000	115,000 10 days	115,000 10.5 days
100-Year Peak Duration ≥ 25,000	115,000 15 days	115,000 15 days
200-Year Peak Duration	115,000 10 days	115,000 10.5 days
400-Year Peak Duration	115,000 15 days	115,000 15 days

WATER SUPPLY

No-Action Condition

Folsom Reservoir would be operated to reserve 400,000/670,000 acre-feet of storage space annually. Providing between 400,000 acre-feet and 670,000 acre-feet of storage from mid-November to mid-March, depending on precipitation, would have some minor effects on delivery of local water supply. This increased flood storage capacity would also result in an average slight reduction (about 5,000 acre-feet) in the total winter deliveries of the CVP and average lower water storage in Folsom of 40,000 acre-feet.

Impacts

Operation of the detention dam would benefit the water supply capabilities of the CVP/SWP. Returning the operation of Folsom Reservoir to 400,000 acre-feet of reserved flood storage space from 400,000/670,000 would have the benefit of reducing the required winter drawdown by as much as 270,000 acre-feet during certain years. This would have some minor benefits to local and CVP/SWP water supply deliveries, since the water level would on average be slightly higher during the winter. The benefits would be most noticeable at Folsom, but effects would be felt at other CVP/SWP facilities. Decreasing the storage requirement would result in returning the amount of water available for delivery into the CVP/SWP to the quantities prior to reoperation of the system, eliminating the obligation of replacing these annual water losses.

Mitigation

No mitigation would be required.

HYDROPOWER

No-Action Condition

As discussed for water supply above, Folsom Reservoir would be operated to reserve 400,000/670,000 acre-feet of storage space on an annual basis.

Impacts

Operation of the detention dam would benefit the hydropower capabilities of the CVP/SWP. Returning the operation of Folsom Reservoir to 400,000 acre-feet of reserved flood storage space from 400,000/670,000 would have the benefit of reducing the required winter drawdown by as much as 270,000 acre-feet during certain years. This reduction would have some minor benefits on hydropower deliveries, since the water level would on average be slightly higher during the winter months. The benefits would be most noticeable at Folsom, but effects would be felt at other CVP/SWP facilities. Decreasing the storage requirement would result in returning the amount of water available for generating hydropower to the quantities which existed prior to reoperation of the system. This would eliminate the obligation of replacing these power losses, estimated at approximately 12 GWh per year and 4 MW. Up to 9,000 acre-feet of CVP/SWP water would be available per year.

Mitigation

No mitigation would be required.

RECREATION

No-Action Condition

Upper American River. Reclamation contracted with the Department of Parks and Recreation to provide recreation and public-use management services on the lands within the boundaries of the multipurpose Auburn Dam project, known as the ASRA (Auburn State Recreation Area). The ASRA includes 42,000 acres and 48 miles of the American River, extending from the damsite upstream beyond the project boundary to the Iowa Hill Bridge on the North Fork to Oxbow Reservoir on the South Fork.

Its nearness to major population centers and diverse recreation base make the ASRA one of the most used and significant recreation resources in northern California. Local interest in recreation is very heavy. Bicycling has increased dramatically in the area. There is continuing demand for equestrian and other trails. The Tevis Cup horse race and the Western States Run, both 1-day, 100-mile events, use the Western States Trail from Auburn to Squaw Valley. These events draw entrants from around the world. Whitewater boating on the Middle and North Forks of the American River is of State and national significance. Both forks offer overnight camping opportunities, hiking trails, cultural and natural observation sites, and a diversity of difficulty in whitewater rapids from beginning to advanced boating skill levels. The nearby South Fork of the American River offers a less challenging whitewater experience, and because of the predominance of private lands and development along the river corridor, camping is restricted. The nearest similar "wilderness" whitewater river providing overnight trips is the Tuolumne River about 100 miles southeast of the recreation area.

Approximately 72 miles of hiking trails, 66 miles of equestrian trails, and 15 miles of fire road are open to mountain bikes in the ASRA and provide year-round recreation opportunities. The trails and roads include Manzanita Trail, Middle Road Trail, Pointed Rock Trail, Old Quarry Road Trail, Tinkers Cutoff, Old Stage Road, Old Auburn-Foresthill Road, a number of other trails, and many mountain bike trails. Additionally, the Western States Trail has been included as the trans-Sierra route of the proposed coast-to-coast American Discovery National Trail.

During large storms with heavy rainfall, the soil on the canyon sides becomes saturated and is highly susceptible to sloughing at unstable areas such as road cuts and trails. This type of slippage would disrupt recreation and recreation access. The Department of Parks and Recreation has the responsibility for maintaining these trails; due to budget constraints, maintenance that is conducted is accomplished by volunteer workers, usually associated with the Western States Endurance Run.

Folsom Reservoir. Folsom Reservoir supports numerous water-based activities such as boating, waterskiing, and fishing. The shoreline provides sandy swimming beaches, both formal (with lifeguard services) and informal. Surrounding Folsom Reservoir is a landscape with important scenic, natural, and cultural values. Recreational facilities include camping

and picnic areas, boat launch ramps, restrooms, concessions, bicycle and mountain bike trails, and equestrian trails and staging areas.

The exceedence frequencies for boating and swimming activities at Folsom Reservoir under the No-Action Condition are described here. All boat ramps would be out of operation 1 percent of the time (5 out of 350 months) during the peak season and 2 percent of the time (9 out of 490 months) during the off-season. Boat ramp availability would be limited 26 percent of the time (92 out of 350 months) during the peak-use season and 52 percent of the time (255 out of 490 months) during the off-season. Usable surface area for boating would become constrained 8 percent of the time (29 out of 350 months) during the peak-use season and 32 percent of the time (157 out of 490 months) during the off-season. The optimal lake elevation for boating would be exceeded 40 percent of the time during the peak use season.

Swimming and beach use areas would be inundated 27 percent of the time (94 out of 350 months). The optimal lake elevation threshold for swimming and beach use would be exceeded 40 percent of the time (140 out of 350 months).

The lake level threshold at which boat ramp availability becomes constrained would be exceeded for five 2-year periods during the peak use season and for seven 2-year periods during the off season.

Under the No-Action Condition, use at Folsom Reservoir is predicted to be 2.27 million visitor-days during the April through August peak use period.

Lower American River. The exceedence frequencies for both boating and swimming activities on the lower American River are described here. The minimum impact threshold for boating activities would be exceeded 23 percent of the time (64 out of 280 months). The optimal impact threshold for boating activities would be exceeded 46 percent of the time (130 out of 280 months). For swimming activities, the impact threshold would be exceeded 18 percent of the time (51 out of 280 months), whereas the water temperature impact threshold would be exceeded 48 percent of the time (131 out of 276 months).

For fishing activities, the fisheries analysis found that water temperature and flow fluctuations under the No-Action Condition had no substantial effect on available fish habitat.

Significance Criteria

Impacts on boating, swimming, fishing, and wading at Folsom Reservoir and along the lower American River were considered significant if changes in flows or water temperature would result in a 10 percent reduction in recreational use when compared to the No-Action Alternative. Impacts to recreational resources in the American River canyon were considered significant if a substantially long-term disruption to existing institutionally recognized activities would be realized. Changes in the quality, such as visual quality, of the

recreation experience were considered in assessing the significance of effects to recreation in the canyon.

Impacts

Upper American River. This discussion focuses on three potential operational impacts: (1) reduced access to canyon recreation opportunities due to the potential abandonment of old Highway 49, trail washouts, and the infrequent, temporary inundation of up to 40 miles of the North and Middle Fork canyons during the flood season; (2) potential decline in the visual quality of the canyons due to the physical presence of the dam, the potential for vegetative losses due to inundation mortality, and the potential for a scarring of canyon walls within the inundation zone due to reservoir-induced soil slippage; and (3) disruption of boating facilities at Lake Clementine due to periodic inundation.

The primary recreation impact would result from infrequent temporary inundation of the river up to an elevation of 942 feet. This inundation would likely be during mid-winter (December-February) rainstorms. Over time, however, this periodic inundation would result in changes in the density of vegetation along the forks of the river and at Lake Clementine due to accelerated mortality. This type of impact and associated mitigation is more fully discussed under the section in this chapter on operational impacts to vegetation and wildlife. Trail slippage or blocked trails could create public safety concerns and affect recreation use. The detention dam has been designed to control drawdown rates which would significantly reduce any additional (above No-Action Condition) sloughing associated with pool inundation. Inundation of the upper American River might cause floating debris such as logs, limbs, and sediment to be deposited on roads, trails, or other recreation sites and cause disruptions until maintenance crews could clear the obstructions. It is also possible that some trails, including the Western States Trail, could wash out along lower-lying trail alignments. Although minor, these individual impacts, when added together, would constitute a significant effect.

Because most of the recreation in the upper American River is tied directly to water access, recreation, including fishing, would not be disrupted by minor changes in vegetation or the visual resource base. Consequently, adverse effects to visual resources in the area would not constitute a significant adverse effect to recreation. Because adverse effects to visual resources due to operation of the detention dam are unavoidable, an adaptive management plan that would include replacement of plants following inundation would ensure that the visual character of the canyon would remain essentially unchanged in the future.

All existing public lands within the project limits would remain in public ownership. It is also assumed public lands outside the flood control pool area, but within Reclamation's 42,000-acre Auburn Dam project boundary, would be retained in public ownership. Reclamation and the Department of Parks and Recreation are expected to continue to manage these lands until a long-term decision is made to develop the resources available at the Auburn site. Thus, no loss of public access to recreation resources would be expected under the project or the without-project condition.

Confluence Area. The periodic inundation of the canyon by the flood control pool would result in changes in the composition of bank vegetation along the rivers and at Lake Clementine. It is estimated that a 200-year event would create a flood detention pool with a surface elevation of 923.7, which could last up to 7-1/2 days. In the unlikely event the pool remained at that elevation for more than 7 days, the youngest individuals in the chaparral, interior live oak, and canyon oak communities would experience some mortality. This die-off of a portion of the chaparral and evergreen plant communities would change the overall appearance of the area for the short term. However, replanting accomplished under the adaptive management plan would soon restore the vegetative character.

Most of the recreational use in the project area is directly tied to water access or off-highway vehicle activity, so use would not be significantly affected by these changes in the vegetation or visual resource base. Although use levels may not change, the experience of some users may be adversely affected.

Under the No-Action Alternative, velocities associated with high river flows could reduce the structural and historic integrity of the Mountain Quarries/No Hands Bridge. Periodic inundation of the canyon under the Detention Dam Plan is not expected to adversely affect the bridge and would likely maintain a higher degree of stability than the bridge would experience under the No-Action Alternative.

After Highway 49 is replaced the existing portion would remain under the jurisdiction of Placer and El Dorado Counties. The non-Federal sponsor has agreed to maintain the existing Highway 49 road and make any necessary repairs after an inundation event. The road would remain available for continued recreational use, so no adverse effect would be expected.

Lake Clementine. The marina's floating docks, now leased to the Auburn Boat Club, may be adversely affected by periodic inundation. The gas sales service and existing toilet facilities not capable of withstanding periodic inundation may need to be removed or replaced to prevent contamination of the lake. The permanent facilities such as the launch ramp at the lake and structures have been flood proofed and would not be affected by inundation. North Fork Dam would withstand inundation.

Upper North and Middle Forks. Project operations would not significantly affect the amount or patterns of recreational use associated with either fork of the river. Though a 400-year event would create a flood control pool extending approximately 3 miles upstream from Ponderosa Way (the last point for whitewater boating activity on the North Fork), inundation would last less than 6 days during a period of minimal use, with little quantifiable impacts. On the Middle Fork, the pool would extend to Buckeye Point and submerge the Greenwood Bridge crossing under approximately 90 feet of water at peak inundation. Although numerous access roads to recreation sites in the upper American River could be temporarily unavailable during inundation, recreation impacts would be negligible, since the flooding would take place during the winter, and recreation use is at its peak during the spring and summer.

Folsom Reservoir. Returning operation of Folsom Reservoir to 400,000 acre-feet of reserved flood storage space from 400,000/670,000 acre-feet would have the benefit of reducing the required winter drawdown by as much as 270,000 acre-feet during certain years. This would have some minor benefits on recreation, since the water level would generally be slightly higher during the winter. By reducing the requirement that the reservoir be drawn down so far during very wet winters, the reservoir would be more likely to refill to capacity each recreation season.

The exceedence frequencies for boating and swimming at Folsom Reservoir under the fixed condition of 400,000 acre-feet are described here. All boat ramps would be out of operation 1 percent of the time (5 out of 350 months) during peak season and 2 percent of the time (11 out of 490 months) during the off-season. Boat ramp availability would be limited 27 percent of the time (93 out of 350 months) during the peak use season and 47 percent of the time (230 out of 490 months) during the off-season. Usable surface area for boating would become constrained 9 percent of the time (30 out of 350 months) during the peak-use season and 30 percent of the time (149 out of 490 months) during the off-season. The optimal lake elevation for boating would be exceeded 39 percent of the time (136 out of 350 months) during the peak use season. However, when compared to the No-Action Condition, the 10 percent significance criteria would not be exceeded.

Swimming and beach use areas would be inundated 28 percent of the time (97 out of 350 months). The optimal lake elevation threshold for swimming and beach use would be exceeded 39 percent of the time (136 out of 350 months). However, when compared to the No-Action Condition, the 10 percent significance criteria would not be exceeded.

Under the fixed operation of 400,000 acre-feet, use at Folsom Reservoir is predicted to be 2.3 million visitor-days during the April through August peak-use period.

Lower American River. The exceedence frequencies for both boating and swimming activities on the lower American River are described here. The minimum impact threshold for boating activities would be exceeded 22 percent of the time (61 out of 280 months). The optimal impact threshold for boating activities would be exceeded 45 percent of the time (127 out of 280 months). For swimming activities, the impact threshold would be exceeded 19 percent of the time (53 out of 280 months), whereas the water temperature impact threshold would be exceeded 48 percent of the time (132 out of 276 months). However, when compared to the No-Action Condition, the 10 percent significance criteria would not be exceeded.

For fishing activities, the fisheries analysis found that water temperature and flow fluctuations under the 400,000 acre-foot operation had no substantial effect on available fish habitat.

Mitigation

Infrequent, temporary impoundments behind the detention dam are not expected to result in the permanent loss of recreation resources upstream from the detention dam. Maintaining the current access from Highway 49 to the Auburn State Recreation Area ensures that activities served by the access such as swimming, fishing, mountain biking, hiking, and picnicking would remain viable in the confluence area of the North and Middle Forks of the American River. Reclamation and the Department of Parks and Recreation are expected to continue to manage these lands until a long-term decision is made to develop the resources available at the Auburn site. The non-Federal sponsor has made a commitment to acquire the necessary real estate rights and restore formally recognized roads and trails that are damaged as a result of project-induced inundation.

An adaptive management plan includes trail and road restoration for access to vegetation monitoring sites within the inundation area. This mitigation would reduce impacts to recreation, including fishing access, to less-than-significant levels.

Should it become necessary, either due to damage from high flows or inundation, the Western States Recreation Trail could be rerouted from the Mountain Quarries/No Hands Bridge to the crossing of the American River at the nearby, existing Highway 49 Bridge. Rerouting the trail for a short distance would maintain the functional qualities of the trail, and recreational use would not likely decrease.

Mitigation at Lake Clementine for effects caused by periodic inundation would remain consistent with the lease agreement between the marina operator and Reclamation. The agreement requires portable fueling and restroom facilities. Because the Lake Clementine area was flooded when Reclamation's cofferdam was in operation, permanent facilities or structures have been flood proofed, and no additional work would be required. The floating docks would either be removed during the winter or converted over time to fixed structures.

FISHERIES

No-Action Condition

Lower American River. A discussion of the No-Action Conditions for the fishery of the lower American River and Folsom Reservoir is presented in chapter 7. Returning Folsom Reservoir to 400,000 acre-feet of fixed storage would have benefits to fishery resources in the reservoir because lake levels would be stabilized when the flow regime is returned to the 1986 Diagram.

Upper American River. Historical documentation on fisheries in the area is limited. Currently, year-round resident fishes of the North Fork include several warmwater species, among them smallmouth bass, bullhead, and sunfish. The river has many pools and riffles with gravels suitable for trout and smallmouth bass. But low summer flows and high water

temperatures greatly reduce the use of this habitat by coldwater species. Surveys by the FWS (U. S. Fish and Wildlife Service) on September 20 to 28, 1989, found 38 fish, including warmwater species such as smallmouth bass, riffle sculpin, Sacramento sucker, Sacramento squawfish, and brown bullhead, while trout were scarce. Lake Clementine contains a similar species composition; however, DFG (California Department of Fish and Game) periodically plants trout.

Historical records of fish resources in the Middle Fork are limited. Construction of the Middle Fork American River project by Placer County Water Agency resulted in cooler water temperatures in summer and fall and improved habitat suitability for resident and stocked coldwater species, including rainbow and brown trout. In the past, rainbow and brown trout have been stocked in the Middle Fork. Resident fish species in the Middle Fork include Sacramento hitch, Sacramento sucker, Sacramento squawfish, riffle sculpin, and brown and rainbow trout. Fish species that are year-round residents of the North Fork include smallmouth bass, bullhead, sunfish, riffle sculpin, Sacramento sucker, and Sacramento squawfish. Rainbow and brown trout are stocked yearly.

Ongoing instream mining operations and the results of earlier construction at the Auburn Dam site are the most apparent disturbances along the river. The Middle Fork American River, in contrast, supports both warmwater and coldwater species year-round. Cooler temperatures resulting from the Middle Fork American River Project support brown and rainbow trout for about 10 miles below Oxbow Dam. Habitat is more suitable for warmwater species below this point.

North Fork. Below the Colfax-Iowa Hill Bridge, the North Fork flows through steep-sided canyons with 30 to 60 percent or greater slopes. Riffles are generally small in area and interspersed between series of deep pools and cascades. All 25 miles surveyed by FWS in 1989 contain suitable rearing habitat for resident fish. The riffle area and pool complexes in the area do not change significantly, since they are constrained by geological formations that restrict flows. further discussion of this is provided in the Water Quality discussion of this chapter. However, low summer flows and high water temperatures reduce habitat suitability for coldwater species.

A total of 58 riffles and 64 pools occur from the Colfax-Iowa Hill Bridge downstream 25 miles to the Auburn Dam site. Forty-three of the fifty-eight riffle areas (77 percent) are in an 8-mile stretch between Shirttail Creek and Lake Clementine. The average riffle is 196 feet long, 82 feet wide, and 4 feet deep. The average pool is 246 foot long, 77 foot wide, and 14 foot deep. The majority of these riffles had significant areas with a combination of gravels from 0.25 to 3.0 inches diameter and underlying cobbles suitable for trout and smallmouth bass spawning (Reiser and Bjornn, 1979; FWS, 1983, 1984). Sediments covered less than 25 percent of these gravel areas (FWS, 1991).

Historical background on fish resources of the North Fork is limited. DFG records of stream surveys from 1934-38 prior to construction of Folsom Dam indicated that a variety of warm and cold water species were observed. Post-Folsom Dam surveys in 1965 also

included smallmouth bass in addition to those found in the 1930's, and densities of approximately 100 trout per mile were observed (FWS, 1991).

Lake Clementine begins about 3.5 miles above the Auburn Dam site and extends 5 miles upstream. Similar fish species occur in the North Fork and in Lake Clementine. DFG periodically stocks rainbow trout in Lake Clementine. Records for angler use show about 5,000 angler-day annually are spent on Lake Clementine. The lake contains several species of game and nongame fish, including rainbow trout; smallmouthed bass; catfish; bluefish; carp; and squawfish. Access to lower Lake Clementine is limited due to parking and boat launching space constraints (FWS, 1991).

Below Lake Clementine, there are fewer riffles, and increased sediment deposition is evident. Below the Middle Fork confluence, gravel sizes decrease and sandbar deposits increase. The 3/4-mile stretch of channel above the Bureau's cofferdam site is covered by sand deposits which accumulated during operation of the cofferdam (FWS, 1991).

Throughout the reach from Colfax-Iowa Hill to Auburn Dam site, fringes of riparian vegetation overhang the channel. Willow, alder, and blackberry are predominant. Large gravel bars are also sparsely vegetated with these species. The steep canyons and narrow channel likely have a much greater influence on water temperature than the overhanging vegetation. Daily incidence of direct sunlight exposure on the river is greatly reduced by the steep and closely adjoining canyon walls (FWS, 1991).

Disturbance of the substrate is evident along most of the river channel, due apparently to numerous instream mining operations. Tailing piles and diversions are common. Surveys (FWS, 1989) indicate that low flows and high temperature in the summer favor greater abundance of warmwater species. Smallmouth bass, riffle sculpin, Sacramento sucker, Sacramento squawfish, and brown bullhead were found in significant numbers in pools and riffles, whereas trout were scarce. A fish sampling survey by FWS along the North Fork American River from September 20 to 28, 1989, identified 25 smallmouth bass, 2 Sacramento squawfish, 3 riffle sculpin, 3 Sacramento sucker, 3 brown bullhead, 3 green sunfish, and 1 rainbow trout (FWS, 1991).

Sport fishing is concentrated at the major access points along the river (for instance, at the Colfax-Iowa Hill Bridge, the Yankee Jim Bridge, the Ponderosa Way Bridge and other vehicle access roads) (FWS, 1991).

Middle Fork. From Oxbow Reservoir/Ralston Afterbay downstream to the confluence, the Middle Fork flows through steep-sided canyons of 30 percent or greater slopes. Riparian vegetation comprised of willows, alder, blackberry and some cottonwood overhangs the channel in many places. Similar to the North Fork, the steep canyon walls and narrow stream channel likely influence water temperature more than the overhanging vegetation. Construction of the Placer County Water Agency's Middle Fork American River project in 1962, above and including Oxbow Reservoir, provided much cooler water

temperatures during the summer and fall, thereby improving habitat suitability for resident coldwater species (FWS, 1991).

Overall, 66 riffles and 67 pools are in this segment of the Middle Fork. The average riffle is 132 feet long, 106 feet wide, and 6 feet deep. Riffle areas in the uppermost portion (upper 3 miles) above Kanaka Rapids generally contained cobbles and boulders (10 to 160 inches diameter) unsuitable for trout and smallmouth bass spawning. Below Kanaka Rapids, wide beds of gravel of 0.25 inch to 3.0 inches in diameter and larger, with less than 25 percent fines covering the surface, were common. There are also numerous smaller gravel areas in shallow pools, along channel margins, and on inside bends. Suitable spawning habitat for trout and smallmouth bass is present from below Kanaka Rapids to the confluence (FWS, 1991).

Evidence of gold dredging and substrate disturbance (tailing piles and turbidity) is common throughout the river segment. Twenty-one active dredges were observed during a 2-day float. The greatest activity and substrate disturbance is in the upper 5 miles from Oxbow Reservoir to Cache Rock, where 15 dredges were observed. The survey was conducted at the beginning of the dredging season, and dredging probably increases greatly through the summer (FWS, 1991).

Historical records of fish resources in the Middle Fork are also limited. DFG records of stream surveys done in 1938 prior to Folsom Dam construction indicate a variety of species present. In addition, records indicate that rainbow and brown trout were stocked from 1930-49 and then again in the mid-1960's (post-Folsom Dam). Compared to the North Fork, the Middle Fork has a much greater relative abundance of coldwater species versus warmwater species (FWS, 1991).

A fish sampling survey by FWS along the Middle Fork American River between September 20-28, 1989, identified 18 Sacramento hitch, 10 Sacramento sucker, 11 Sacramento squawfish, 2 riffle sculpin, 4 brown trout, 3 rainbow trout; 3 fish could not be identified (FWS, 1991).

In summary, the North Fork American River from the Auburn Dam site to the Colfax-Iowa Hill Bridge contains about 20 miles of free-flowing stream habitat and 5 miles of reservoir habitat (Lake Clementine) suitable for warmwater fish production. Major disturbances appear to have been caused by instream mining and the washed out Auburn cofferdam. In contrast, the Middle Fork American River contains about 24 miles of free-flowing stream habitat suitable for both warmwater and coldwater fish; the coldwater habitat is a consequence of the Middle Fork American River project. Instream mining appears to be a major disturbance factor in this reach (FWS, 1991).

The effects of a 200-year sized detention dam on sediment transport were analyzed to help in the design of the dam and outlet configuration. This draft report (*Geomorphic, Sediment Engineering and Channel Stability Analysis, Resource Consultants and Engineering, 1993*) compared the base (no-action) condition to a detention dam with 12 sluice gates to

learn how sediment would affect the sluices and gates. This study considered the quantity and size of the material being transported by the river. Where the material would likely be deposited during high flows under the base and project conditions was also evaluated. As a result of this study, the number of sluices has been increased from 12 to 20. Operation of the gates to control drawdown rates would significantly reduce sloughing associated with pool inundation. This study is discussed in more detail under the Water Quality discussion.

The change in design and operation of the dam has made the without- and with-project conditions much closer, significantly reducing the effects of sedimentation on the aquatic environment and the limited fisheries resources in the project area. With a dam in place, sediment would be transported during the early part of a storm when the water is contained in the stream channel. As flows increase and the water begins to back up behind the dam, sediment in the water would start to settle out. When the storm passes and the drawdown begins, the flow rate would accelerate as the water returns to the channel. This acceleration of flows would again transport sediment downstream until the velocities were not sufficient to move the bedload. The second episode of sediment transport would somewhat cleanse the material deposited during the impoundment.

During February 1986, a 2-day average flow of 46,000 cfs was measured at the Foresthill gaging station, and water depths of 30 feet were noted at high-water marks on the canyon wall. Flows were estimated to have velocities of 20 to 25 feet per second. This storm was calculated to have a return frequency of about a 67-year storm. During a 200-year storm, it is calculated that peak inflows past the damsite would be about 300,000 cfs. Model runs indicate that this would result in water depths of approximately 60 feet. For a 400-year storm, peak inflows would be about 510,000 cfs and water depths about 68 feet. Flows of this magnitude would likely result in all but the most sheltered fish being swept out of the river into Folsom Reservoir and would also cause the cobbles and sediment in the riverbed to move and be redeposited into new bars or at the existing bars along the river.

Significance Criteria

For purposes of this evaluation, fisheries impacts were considered significant if operation of the project would substantially interfere with the movement of any resident or migratory fish, substantially diminish habitat for fish, or involve discharge of material which poses a hazard to fish.

Impacts

Operation of the detention dam would not result in any adverse impacts to fisheries in the upper or lower American River. The flows in the river would not be altered except during storms having a return frequency of greater than 1 chance in 20 in any given year (a 20-year storm). Controlled drawdown rates would significantly reduce sloughing associated with pool inundation. Flows in the river during storms would continue to reconfigure the

streambed upstream from the ponded area, and when the stormwaters recede, the velocities in the streambed would accelerate and cleanse the gravels and cobbles present.

The ponding of waters during extreme storms would generally prevent velocities which would otherwise be sufficient to adversely affect resident fishes. The natural reworking of the riverbed prior to ponding and during the drawdown phase of a storm would ensure that spawning areas throughout the North and Middle Forks would remain available for the foreseeable future.

There would be no change in flows in the lower American River because the 20 sluices at the detention dam would allow flows for smaller storms to pass unimpeded into and through Folsom Reservoir. The flows greater than 25,000 cfs (out of the river channel) in the lower American River are unchanged for the 5-year storm (3 days); 10-year storm (4 days); 20-year storm (5.5 days); and 100-year storm (15 days). For the 50-year storm, the flows greater than 25,000 cfs would be extended by about 12 hours; and for a 200-year storm, the release would last 21 days with a detention dam in place. Without the dam in place, flows would exceed the downstream levee capacity, resulting in a levee failure and flood in Sacramento.

For the smaller events, there would be no difference in the peak flows whether the dam is in place or not. Consequently, there would be no affect on downstream water quality. For the larger events, the same volume of water would pass through the system whether the dam is in place or not. In this instance, the peak flows are reduced and the duration extended. For the higher events (greater than a 100-year storm) the peak flows would exceed the levee capacity, resulting in levee failure and flooding. Should there be flows along the lower American River that resulted in levee overtopping or failure, water would flood the city both to the north and south. While there would be areas of deep ponding, eventually the water would return to the system south of Sacramento after flowing through the developed areas. These waters would pick a load of contaminants from the various industrial parks, sewage treatment facilities and residential areas flooded. Waters flowing back into the system would deliver this contaminant load into the lower Sacramento River and the Delta.

There would be no adverse operational impacts to the fisheries resources in the lower American River from restoring operation of Folsom Reservoir to the fixed storage of 400,000 acre-feet which existed prior to implementation of the agreement between SAFCA and Reclamation.

Mitigation

No mitigation would be required for fishery resources as a result of the Detention Dam Plan.

VEGETATION AND WILDLIFE

No-Action Condition

The study area serves as a transition zone between middle elevation foothill grassland; hardwood woodland and forest communities; and the higher montane, largely evergreen conifer-dominated forest communities. This wide range of physiographic and microclimatic environments provides a diverse and complex vegetation mosaic. Forest dominants in the study area vary among deciduous broadleaved trees, evergreen broadleaved trees, evergreen coniferous trees, and other combinations. Riparian vegetation along the main river corridor includes large areas of flowing open water, rocky shoreline, sand and gravel bars, river-edge willow and shrub thickets, many stands of tall moist forest of varied ages, higher terrace grasslands, and mixed riparian thickets.

Conditions for the lower American River area and the area downstream from the American River are presented in chapters 7 and 8 under the sections discussing construction impacts to vegetation and wildlife.

Cover Type Descriptions. Habitat in the canyons upstream from the proposed damsite includes the specific cover types identified by FWS in 1991 for the HEP (Habitat Evaluation Procedure). Scammell-Tinling and Knudsen (1991) identified inclusive vegetation cover types for use in their HEP study of the 1991 ARWI study area. Seven of these cover types grow between 490 feet msl and 950 feet msl in the inundation area of the detention dam. They are (in descending order of dominance):

- evergreen-hardwood woodland (south slope oak woodland),
- evergreen-hardwood forest (north slope black oak forest),
- riverine/riparian
- conifer forest,
- chaparral,
- grassland-savanna, and
- rocky/ruderal.

The project area contains approximately 3,911 acres of oak woodlands, 393 acres of riverine/riparian vegetation, 289 acres of conifer forest, 242 acres of chaparral, and 615 acres of grasslands. The remaining surface area is covered by the river or rocky areas with ruderal vegetation, primarily invader or exotic species.

The composition and condition of each plant community varies from site to site. The type and characteristics of vegetation at any given site are influenced by elevation, slope, aspect, soil type, natural history events, and human disturbances. Approximately 84 acres of upland vegetation types (below the 800-foot elevation) were lost or converted to lower quality cover types in 1973-86 through soil erosion and slippage caused by operation and the 1986 failure of the cofferdam at river mile 47.2 (FWS, 1991).

The following sections briefly describe each plant community.

Evergreen-Hardwood Woodland (South Slope Oak Woodland). This community typically grows on southwest- to south-facing slopes with shallow to moderately deep soils. The canopy is moderately open (30 to 50 percent cover). The most common dominant trees are interior live oak and canyon live oak. Other dominant trees include black oak, blue oak, California bay, and ponderosa pine. Understory composition varies with site conditions. Relatively dry sites have an understory of grassland, which, at lower elevations, intergrades with grassland-savannah. Relatively moist sites may support poison oak, deer brush, styrax, coffeeberry, buckeye, ceanothus, manzanita, clematis, pipevine, and various grasses and forbs (FWS, 1991).

Evergreen-Hardwood Forest (North Slope Black Oak Forest). This community typically grows on north-facing slopes and in other deeply shaded canyon sites. The canopy is dense (50 to 100 percent cover) and mostly 50 to 100 feet high; occasional conifers are over 200 feet tall. The most common dominant trees are canyon live oak and interior live oak. Other dominant trees include black oak, blue oak, California bay, Douglas-fir, ponderosa pine, and madrone. Some of the largest trees grow in steep, moist drainages with dense woody understory (FWS, 1991).

The amount and type of understory vegetation varies greatly with site conditions. Densely shaded sites often have forest litter or bare soil with little understory vegetation. Some low elevation sites have a ground cover of grassland. Sites with moderate shading and moisture availability may support young forest trees and the same shrubs and vines listed for evergreen-hardwood (south slope) woodlands (FWS, 1991).

Riverine/Riparian. Several riparian vegetation types grow along the main stem river corridor above and below the confluence with the Middle Fork, including palustrine forest, dense thickets, and thin strands of palustrine scrub-shrub habitat; areas of frequently inundated grasses and ruderal herbs; and small patches of emergent marsh on backwaters and isolated ponds. Freshwater marsh also occurs at the lower ends of some wet meadows and in some of the small tributary canyons. All these habitats have been grouped in the river/riparian category.

Riparian vegetation in the study area is most abundant along the Middle Fork; lesser amounts grow in the North Fork and below the confluence (FWS, 1991). Palustrine forest is dominated by white alder, Fremont cottonwood, box elder, western sycamore, bigleaf maple, and Oregon ash. Palustrine scrub-shrub is dominated by willows, button bush, and coyote brush (Knudsen, 1991). Emergent marsh areas along the rivers are dominated by cattails, tules, rushes, and sedges (FWS, 1991).

Conifer Forest. Mixed conifer forest grows mostly in the eastern portions of the study area, where stands dominated by ponderosa pine and Douglas-fir grow primarily on north-facing slopes. Conifer forest in the western portion of the study area is limited to small patches dominated by ponderosa pine, foothill pine, or knobcone pine. Other conifers

that are common elements of the Sierran mixed conifer forest are rare or absent within the study area (FWS, 1991).

Chaparral. Chaparral grows on dry, well-drained, shallow soils, often on steep south-facing slopes and ridge-tops. Chaparral is most abundant on south slopes in the canyon of the Middle Fork, where it grows on limestone, serpentine, or gabbro soils. The evergreen woody shrubs that constitute this vegetation type are well adapted to fire and are very effective at holding the soil on steep slopes. The cover is usually very dense and difficult to penetrate. Understory vegetation is usually sparse or absent.

Dominant species in the study area include chamise, whiteleaf manzanita, ceanothus, toyon, and shrubby forms of interior live oak and canyon live oak.

Grassland-Savanna. This community grows where woody vegetation is absent or constitutes less than about 30 percent of the cover. Grassland vegetation is the ground cover in some areas of relatively dry evergreen-hardwood forest. Savanna grows in some areas that are transitional between forest or woodland and open grassland (FWS, 1991). Dominant species are nonnative grasses and forbs, such as bromes, wild oats, annual fescue, wild barley, filaree, clover, yellow star-thistle, and Italian thistle. Many native grassland species are also present in smaller amounts, including California poppies, lupines, brodiaeas, and tarweeds.

Rocky/Ruderal. This category includes barren, disturbed, or eroded areas that have little or no vegetation. Some of these areas were vegetated before the erosion and slope slippage caused by operation and failure of the cofferdam in February 1986 (FWS, 1991).

The riverine areas along the upper American River support a high diversity of habitats (FWS, 1991). Specifically, the north slope forest cover type provides a dense tree habitat with undisturbed drainages for nesting and denning. Species found in this habitat include ringtail cat, grey fox, deer, owls, and many songbird species (FWS, 1991). Thick ground litter provides habitat for amphibians, reptiles, and invertebrates. The ground litter also provides habitat for woodrats and ground-foraging birds. In contrast, the south slope forest is a relatively dry open area in which some of the same species of the north slope forest intermix with species more exclusive to the south slope habitat. These species include turkey vulture, bandtail pigeon, scrub jay, acorn woodpecker, and various warbler species, California thrasher, and various species of vireos and sparrows (FWS, 1991). Additionally, the open, sunny exposures and rocky outcrops provide habitat for the western fence lizard and other species of snakes and lizards.

The drier digger pine conifer forests provide habitat for overlap species from the nearby chaparral such as gray fox, coyote, deer, wood rat, wrentit, scrub jay, thrasher, brush mice, badger, and bobcat (FWS, 1991). The more mesic ponderosa pine and incense cedar stands often support red fox, porcupine, mountain lion, raccoon, beaver, deer mouse,

California vole, mink, and forest birds such as Townsend's solitaire, pine siskin, gnatcatcher, nuthatch, western wood pewee, various thrushes, warblers, and grosbeak (FWS, 1991).

The chaparral cover type is usually a fire-adapted type of habitat that can vary greatly in its value to wildlife. Dense stands with little ground vegetation and almost complete canopy closure present low value to wildlife compared to a recently burned area with open areas and young plants and shrubs for foraging. In the Auburn area, chaparral areas are not usually allowed to experience the natural fire regime because of fire avoidance and prevention. Therefore, the chaparral areas are indirectly allowed to mature to decadent, essentially monoculture stands of one or two dominant shrubs with relatively low wildlife values (FWS, 1991). The grassland habitats in the upper American River area vary in terms of their value for wildlife depending on the location (elevation) and size of the area.

Upper American River

Significance Criteria. For purposes of this analysis, impacts were considered significant if operation of the project would substantially interfere with the movement of any resident or migratory wildlife species, substantially diminish habitat for wildlife, or involve the disposal of material which could pose a hazard to wildlife or plant populations.

Methodology.

Inundation Damages. To estimate the loss of vegetation resulting from operation of the dry dam, it was first necessary to determine the flood tolerance of the principal species inhabiting the cover types affected by inundation. This element focused primarily on three cover types: oak woodlands, chaparral, and conifer forest. There are no significant operational impacts to grassland and riparian communities; therefore, these cover types were not reanalyzed.

Several means were used to estimate the impact of periodic short-term flooding on the vegetation within the inundation zone of the proposed dry dam. The inundation study prepared for the previous 1991 ARWI EIS/EIR was reviewed. This study compiled scientific literature pertaining to the physiological effects of flooding on plants and the influence of the growing season on flood tolerance. The report summarized the limited information available in the literature pertaining to the flood tolerance of dominant plants in the American River canyon. The study also described the effects of limited flooding on similar plant communities along the Sacramento River near Redding, the lower American River, and along the inundation zones of reservoirs in the San Gabriel Mountains in Southern California. Based on these data, the report estimated direct and indirect losses of vegetation from construction and operation of the proposed dry dam. Since completion of that report, the design of the dry dam has been revised to minimize potential impacts of canyon sloughing by reducing the vertical drawdown rate of the flood pool. This has resulted in increased duration of flooding and higher elevations within the inundation zone than were reflected in the previous section.

Since the completion of the 1991 ARWI EIS/EIR, two additional studies have been conducted to estimate the flood tolerance of typical woody plants in the American River canyon. The first study (*Short and Long-term Impacts of Periodic Flooding on Chaparral and Oak Woodland Species Along the Upper Sacramento River, Shasta County, California*, Meredith, et al., 1995) involved the analysis of impacts to a variety of oak woodland and chaparral tree and shrub species resulting from flooding along the Sacramento River below Keswick Dam. This study is included in appendix H. A study plot that was flooded during 1993 was examined to determine the survival of a variety of plants. In addition, the growth and condition of a group of whiteleaf manzanita plants flooded in 1993 were compared to a series of nonflooded plants. The study also examined the long-term impact of flooding on the oak woodland and chaparral plants. The second study (*Tolerance of Plants to Deepwater Flooding*, Hart et al., 1995) analyzed the response of a variety of immature oak woodland and chaparral plants to a series of submergence trials in Folsom Reservoir. This study is included in appendix H. Treatment depths were 37.5 feet, 100 feet, and 175 feet, and submergence durations were 7 and 13 days. The survival/mortality rates were observed immediately after the submergence tests and monitored for approximately 10 months through an entire growing season to track changes in growth and condition.

In both studies, the species were selected to represent dominant species in the American River canyon. Although these studies provide insight into the general inundation tolerance of the species, there remain uncertainties that cannot be completely addressed due to logistical constraints. For example, the Keswick study examined an array of plant sizes from seedlings to mature individuals; however, the flooding was shallow. The Folsom Lake submergence study involved deep flooding (to 175 feet), but included only young potted plants. Consequently, a data gap exists for the deep flooding of large, mature plants.

The submergence test substantiated that there are clear differences in the flood tolerance of specific species of plants. For example, manzanita suffered no losses, whereas chamise and toyon suffered almost 100 percent mortalities. Depth did not appear to exert a major influence on survival; however, duration was a critical factor. For example, foothill pine incurred moderate losses (8 to 25 percent) after 7 days of inundation regardless of depth, but high mortalities (67 to 92 percent) after 13 days of inundation. This study examined only young plants, which are generally believed to be much more vulnerable to flooding than more mature plants. Also, the overall condition of the individual species was variable. The chamise plants were first-year sprouts and were generally less than 1 foot in length. The study also revealed an apparent lag in mortality in some species. Immediately after the submergence trials in February 1994, the foothill pine group suffered only one mortality. By July, mortality increased to 6; by October, 33 specimens had died. Because no control plants died, mortality was attributed to the flooding. Immediately after the submergence test, seven toyon survived, but all died by the end of the study. However, in this case 50 percent of the controls also died, which suggests the plants may have been stressed prior to the experiment. Coffeeberry initially did not experience any mortality; however, by October, 10 plants had died. Chamise suffered a high initial loss, but the survivors remained alive throughout the growing season.

The Keswick study supported many of the findings of the submergence study. First, whiteleaf manzanita experience approximately 20 percent mortality, but in each species, those individuals that died were generally immature. In fact, the mortality of interior live oak was almost exclusively confined to a cluster of small seedlings under a foothill pine tree. Because many other young plants did survive in other areas suggests that confounding factors may be contributory. Other species, such as wedgeleaf ceanothus, western redbud, coffeeberry, and mountain-mahogany, did not suffer any mortalities; however, the sample sizes were very small (two to six specimens), and no statistically significant inference was drawn. Second, the loss estimation analysis determined the approximate composition, density, and coverage of various species within the oak-woodland, mixed conifer woodland, and chaparral communities.

Field sampling was performed in conjunction with the HEP evaluation, and a relative rating of the value of the various cover types was made based on representative species typically occupying various feeding and/or breeding guilds within those cover types (Corps, 1991; FWS, 1990).

Studies by FWS in 1989 in or near the project site in the American River canyon reported densities between 29 and 175 trees/acre (mean = 112/acre) and 194 shrubs/acre (113-279) for blue oak-foothill pine woodlands; between 96 and 167 trees/acre (mean = 133) for black oak woodlands; and between 33 and 179 trees/acre (mean = 112) for conifer forests.

In an analysis of 635 Vegetation-Type Map data plots established by Weislander in the 1930's, Griffin (1988) reported oak woodland densities of 73 trees/acre near Jackson, 89 trees/acre near Chico, and 60 trees/acre near Redding. Based on an analysis of six oak-dominated map plots within the American River canyon provided by Dr. B. Allen-Diaz at the University of California at Berkeley, tree densities were calculated at between 50 and 130 trees/acre. On conifer-dominated habitats, densities in seven plots ranged from 35 to 85 trees/acre. An analysis of oak-dominated woodlands in Sequoia National Park by Vankat and Major (1979) reported densities of 283 trees/acre for blue oak woodlands, 260 trees/acre for lowland interior live oak woodlands, and 240 trees/acre for black oak woodlands. In an analysis of oak woodlands within Marble Valley in El Dorado County, densities of 17 trees/acre in blue oak savannas and 162 trees/acre in interior live oak woodlands were reported (McClelland Consultants, 1990). An analysis of oak woodlands at the proposed Cinnabar development near Shingle Springs in El Dorado County showed densities of 138 trees/acre in closed-canopy interior live oak forests, 80 trees/acre in open-canopy blue oak/interior live oak woodlands, and 8 trees/acre in blue oak/interior live oak savannas (Fugro West, 1995).

The characteristics of oak woodlands were based on the data summarized by Allen et al. (1989, 1991) for a variety of interior live oak-dominated woodlands in the Sierra Nevada foothills. The oak woodlands were separated into categories of overstory and understory canopy, and the cover of each group was adjusted based on the relative percent cover of species. For the chaparral category, specific information regarding average percent cover of

the various species was not available, so the community composition was arbitrarily divided equally between the four principal species.

Landslide Damages. Some deep-seated older landslides in the flood pool area could potentially mobilize to some degree following a fill-and-drain cycle. The FWS in the previous Coordination Act Report reported that this was a significant potential adverse impact associated with the proposed detention dam. To address this concern, staff with the Department of Water Resources, Central District, conducted a reconnaissance-level review of soils maps and aerial photographs to estimate the numbers and areal extent of the landslides, evaluate the potential for future movement, and develop management concepts for prevention and/or mitigation of significant additional landsliding. The results of that study are summarized in the following section.

That analysis showed at least 26 landslides in the proposed 400-year inundation pool area. Most of these landslides are along the southern canyon wall of the Middle Fork of the American River from its confluence with the North Fork to about Poverty Bar at river mile 57. A few landslides are also along the southern canyon wall of the North Fork of the American River, from the confluence to about North Fork Dam at river mile 52.5. Four large landslides were also noted between the proposed damsite and the confluence of the Middle and North Forks, three on the southern canyon wall and one on the northern canyon wall. The landslides along the North Fork are typically smaller than those along the Middle Fork. The combined areal extent of landslides in the 400-year inundation pool is about 15 percent of the total area.

An additional analysis of the area conducted by NRCS found that the most unstable areas are around road and trail cuts through deep soil deposits. This study also noted that these areas are inherently unstable and would be subject to sloughing during heavy rainfall with or without the detention dam.

Movement for most landslides in the reservoir area is generally initiated at their base by means of a small rotational slump. The movement forms a foot-berm in the bottom of the canyon that provides lateral support, which temporarily stabilizes the slump. The slump also forms a scarp part way up the canyon wall. The formation of the scarp removes lateral support for material farther up the slope, initiating another rotational or translational dislocation farther up the hill when conditions are conducive for movement, such as during periods of prolonged heavy rain. This process progresses up the canyon slope until the entire slide mass has moved downslope. The slide mass remains stable until floodflows erode the foot-berm to the point where the lower slump again becomes unstable, at which time the entire process repeats itself.

Landslide Impacts from the 1986 Cofferdam Failure. Following the failure of the cofferdam, several of the landslides along the North Fork of the American River were analyzed. Typically, the landslide masses are heavily vegetated and support many large mature trees. Several new head scarps were noted in the landslides below the high-water mark. The head scarps were all less than 20 feet high and completely devoid of vegetation.

Many of the older trees on the landslides had curved trunks, indicating that the trees have tried to right themselves following previous rotational movements of the slide mass. These trees are a clear indicator that the landslides had occurred at least once prior to the 1986 cofferdam failure. It is difficult to conclude to what degree the 1986 inundation was responsible for aggravating landslide movements. However, the prolonged heavy rains that caused the cofferdam to overflow and wash out in 1986 are probably the same conditions that historically initiated movement of the landslides.

Impacts

The detention dam, by design, would detain water only in connection with high flows in the North and Middle Forks of the river. The duration inundation would be longest immediately behind the dam and would be significantly shorter as the inundation extended up the canyon. The prediction of future storms and flood frequency is a complex process and often uncertain. Historical flow frequency and magnitude of storms and hypothetical and artificial storms based upon computed and measured data are integrated to estimate future conditions.

In addition to the two studies described above, a third analysis was completed by FWS for its CAR to determine impacts to vegetation due to inundation. However, a detailed evaluation of the available data does not support precise estimates of inundation effects on vegetation in the American River canyon.

Both analyses based the estimated loss of vegetation attributable to periodic inundation on (1) reported physiological impacts (lack of oxygen, chemical changes in the soil), (2) physical impacts (toppling, landslides, erosion), (3) published inundation tolerance data on number of species occupying the various vegetation communities, (4) the frequency and duration of expected inundation during the period of analysis, (5) seasonality of flooding (dormant season versus growing season flooding), (6) age and vigor of individual plants, and (7) field examinations of sites with similar vegetative cover that have been periodically flooded in the past.

Flooding, however, is not likely during the growing season for most of the vegetation in the canyon. During winter, most plants are dormant or undergoing reduced physiological activity and are less prone to flooding impacts than plants actively growing. However, certain chaparral species actively grow during the winter, although at reduced levels, and may be affected. Based on hydrologic projections, flooding is not likely to exceed 20 days, which is well within the growing season tolerance ranges for all but the most intolerant species.

The main differences in the two impact analyses stem from the methodologies used to predict slope stability losses and assumptions regarding the effects of periodic inundation on riparian/wetland habitats. The Corps/State analysis considered slope stability losses based on an evaluation of the effects of temporary inundation on the soils in the inundation zone. (See the Geotechnical Appendix M of the 1991 ARWI feasibility report.) FWS analyzed slope

stability based on information from the cofferdam break and aerial photos. Since completion of the 1991 ARWI EIS/EIR, the design of the dry dam has been revised to minimize potential impacts of canyon sloughing by using operational gates to reduce the drawdown rate of the flood pool and to minimize inundation from smaller storm events. This would result in generally lower floodwater elevations within the inundation zone for smaller events, but could lead to slightly longer inundation periods for large storm events.

Loss Estimation. The mortality estimates were applied to the vegetative cover data to estimate the percentage loss by cover type for 7-day (50-year) and 15-day (100-year) flood events. Because no data existed for many of the species commonly found in the oak woodland, the following assumptions were made:

1) The tolerance of interior live oak was applied to all oak species because interior live oak is found in more xeric sites than canyon live oak and because the remaining oak species are deciduous and would be dormant during the flood season.

2) For the understory, if specific mortality data did not exist, a 100 percent loss was assumed.

3) For the conifer forest category, data from foothill pine were used as a proxy for the community. For the chaparral category, specific information regarding average percent cover of the various species was lacking, so the coverage was equally divided between the four principal species and applied the mortality factors.

4) Based on the inundation studies, percent mortality factors resulting from flooding between 0 and 7 days for oak woodland, mixed conifer woodland, and chaparral cover types were estimated to be 26, 15, and 48 percent, respectively, of the gross areal coverage of each community. The riparian communities were assumed to suffer no loss for this duration. For flood durations between 7 and 15 days, the percent mortality factors were 36, 75, and 69 percent for oak woodland, mixed conifer woodland, and chaparral, and the riparian community was assumed to incur a 5 percent loss. No data existed for flood durations in excess of 15 days; however, a 50 percent loss of oak woodlands, a 100 percent loss of mixed conifer woodland and chaparral, and a 10 percent loss of riparian communities was assumed. Because the mortality estimates were derived from studies of immature plants which have generally been found to be the most intolerant life stage, the mortality factors were applied to 20 percent of the areal coverage of each cover type to estimate the losses of the most vulnerable life stages (for instance, seedlings and senescent/infirmed individuals).

5) For the less vulnerable mid-age life stages, estimated to total approximately 80 percent of the coverage of each community, reduced mortality factors were assumed. For durations less than 7 days, 7 to 15 days, and greater than 15 days in oak woodlands, mortality factors were 10, 15, and 25 percent, respectively. For chaparral and conifer forest, the corresponding mortality factors were 10, 15, and 50 percent, and for mid-aged riparian stands, the mortality factors were the same as for the immature individuals.

The mortality factors were then applied to the total acreage within elevation bands represented by the 0-7, 7-15, and >15-day flood durations from the Elevation-Frequency-Duration curve for the 10-, 50-, 100-, 200-, and 400-year flood events. The elevation bands from the GIS (Geographic Information System) did not correspond precisely to the estimated flood elevations from the Elevation-Frequency-Duration curve because the base map contours were at 50-foot intervals. It was, therefore, necessary to interpolate between elevation bands. Based on these assumptions and estimates, a total of approximately 32 acres of vegetation would be lost during a 10-year event, 292 acres during a 50-year event, 361 acres during a 100-year event, 454 acres during a 200-year event, and 935 acres during a 400-year event.

On the basis of the estimated acreage loss by recurrence flood, a curve of acreage loss by exceedence frequency was constructed for each cover type. Integrating the area under each curve provided an average annual equivalent loss for each cover type for the 100-year period of analysis. For oak woodland, an average loss of 21.8 acres/year was estimated; for chaparral, 2.1 acres/year; for conifer woodland, 1.2 acres/year; and for riparian habitats, 1.8 acres/year. A total average annual loss of 26.9 acres was estimated for the period of analysis.

The total loss of acreage by cover type was calculated on an annual basis for the period of analysis assuming a conservative regeneration rate percent/year. Based on these analyses, a total loss of 989 acres of oak woodland, 62 acres of chaparral, 72 acres of conifer woodland, and 97 acres of riparian habitat would be lost over the 100-year period of analysis.

Periodic inundation would temporarily diminish habitat suitability for species inhabiting the area. Loss of vegetation as a result of the periodic inundation over the 100-year period of analysis would be considered a significant adverse impact if left unmitigated. Table 9-2 shows the elevation, probability, and duration of inundation for the flood detention dam.

Inundation could cause wildlife to be lost by drowning, or wildlife could be adversely affected by increased predation while stranded, intraspecific aggression in foreign territory, relocation to less-than-optimal cover, or permanent displacement. In a review of pertinent literature, no specific studies could be found on the effects of a flood-control-only dam on

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TABLE 9-2

Elevation, Probability, and Duration of Inundation for the Flood Detention Dam at Auburn

	400-yr storm
Maximum elevation of inundation	942
Probability of occurrences of flood event: In any given year In the 100-year period of analysis	 0.25% 20%
Duration of inundation by elevation bands at the damsite[1]	
490 - 530	>21 days
530 - 580	19 days
580 - 640	17 days
640 - 720	16 days
720 - 880 [2,3]	11 days
880 - 920	5 days
920 - 950	3 days
950 - 1000	1 day

[1] Duration times reflect those for the average elevation of the band.
[2] The maximum surface elevation for the 200-year event is 869 feet. Duration represents average duration of elevation 720-869. Duration at maximum water-surface elevation (869) is 1 day.
[3] The maximum surface elevation for the 100-year event is 847 feet. Duration represents average duration of elevation 720-847. Duration at maximum water-surface elevation (847) is 1 day.

wildlife species. The effects of flooding on wildlife would vary depending primarily on the ability of the affected species to escape to areas that are high and dry. This mobility would depend on the activity pattern of the species. Animals which are hibernating or otherwise in a reduced activity state would be less mobile. Similarly, animals which are breeding or have immobile young would be less able to stay ahead of the flood.

Large animals, most birds, and many small mammals and reptiles would escape the rising floodwaters and occupy adjacent habitats. However, based on the information derived from the literature, it is likely that losses of the smaller, less mobile species, such as reptiles, amphibians, and dormant or hibernating species, would be significant during periodic inundation. Because of similar adjacent habitats and the reproductive rates of the affected species, recovery would take place over relatively short periods. It is likely that net populations of the most vulnerable species would be lower than at present. Unless more tolerant species replace the net loss, secondary predators would also be affected by the reduction of prey base. These are considered significant adverse impacts. Some of the inundation areas would remain habitable for many species.

Loss Estimation by FWS. For the current ARWP analysis, FWS indicated to the Corps in a letter dated April 19, 1994, and again in its draft CAR, dated July 1995, that it would revise their original impact analysis only if significant changes were made in the project design that would warrant such a revision or if final Section 7 consultation warrants additional endangered species compensation. The Corps has contracted an independent analysis based on new project information which will be reviewed by FWS upon receipt of the analysis and project information. The Corps notes that the current detention dam alternative would differ from the original alternative presented in the 1991 ARWI feasibility report; the dam would have 20 gated outlet sluices as opposed to the original 12 proposed in the 1991 ARWI feasibility report. The Corps states that during floodflows, operation of the gates would (1) decrease flood storage during the more frequent events and (2) slow drawdown in large flood events to reduce the potential of sloughing of the canyon walls. FWS states that they have yet to receive any information on the Detention Dam Alternative which would modify their assumptions regarding fish and wildlife impacts in the Auburn area. Therefore, FWS's 1991 impact analyses for these alternatives, with revisions based on the review by the WLRC (Washington Level Review Center), remain unchanged at this time (FWS, 1995).

The Detention Dam Plan, as previously assessed in FWS's 1991 CAR (Coordination Act Report), would impact an estimated 2,360 acres of fish and wildlife habitat through project-related activities consisting of construction and operation of the dam and reservoir, relocation of Highway 49 and reinforcement of Ponderosa Way, and borrow activities. Habitats affected consist largely of montane riverine, and north and south slope oak woodland (FWS, 1995).

Mitigation Plan. The fundamental premise of the proposed mitigation strategy is that oak woodland, chaparral and conifer forest can be restored so that, over time, wildlife habitat values can be replaced to approximately the same values as presently exist in the American River canyon. While there would be a time lag between implementation of mitigation and the maturation of the habitat (+40 years) to predisturbance levels, actual losses are also expected over time. In other words, it is highly improbable that a 400-year flood event (maximum vegetation loss) would occur until the replacement habitat has matured. In all likelihood, the mitigation would provide an incremental increase in habitat over the period of analysis.

Selection of sites for mitigating significant impacts to native vegetation types as a result of impacts from the operation of the flood detention dam are summarized below. Numerous factors must be considered when selecting sites for mitigation, including :

- restoring degraded sites within the project site;
- converting one habitat type to another (for instance, oak woodlands) with higher habitat values, onsite;
- preserving existing habitat in-kind in the watershed of the project site;

- enhancing/restoring degraded habitats offsite but in the region; and
- preserving high-quality habitats offsite in the region.

Each of these criteria has one or more components or variables that can be implemented to select appropriate and cost-effective mitigation sites. Because the primary objective of the mitigation is to replace habitat values lost as a result of operating the detention dam, mitigation opportunities to accomplish this objective should be the first decision criterion used in selecting sites for mitigation purposes. Costs associated with each mitigation strategy should be used at the second level of site identification.

Site selection should consider the feasibility of restoration of the target vegetation type over the long term. Sites that historically supported the target vegetation type should be given highest priority over areas with only potential to sustain the target vegetation type.

Strategy 1: Avoidance. The primary mitigation objective is to avoid impacts. The current dam configuration was designed to avoid or minimize the impacts to canyon vegetation resulting from canyon sloughing. This has been accomplished by reducing the flood pool drawdown rate through the inclusion of additional sluices.

Strategy 2: Restoring Degraded Habitats Onsite. Because onsite mitigation is preferred, opportunities to replace lost habitat values onsite should be given priority over offsite strategies. This strategy involves two options: (1) an adaptive management plan for the purpose of identifying postflood vegetation losses and implementing of a vegetation restoration program on the actual sites damaged and (2) restore several small sites within the project area that have been degraded or are managed in a manner that prevents full use of the habitat by native plants and wildlife. For example, off-highway vehicle activities at Mammoth Bar in the river canyon currently reduce the number of plants and wildlife that inhabit the site. Removing off-highway vehicles and restoring degraded habitats would improve habitat conditions. Based on analysis of aerial photographs of the project area and supplemented by field reconnaissance surveys, mitigation opportunities appear to be very limited within the inundation zone because the area is presently moderately to densely vegetated in the target cover types.

Strategy 3: Habitat Type Conversion. Habitat type conversion can achieve mitigation goals for the resulting habitat type but may cause additional impacts not associated with the original project. Although habitat type conversion in the river canyon would provide onsite mitigation, this strategy would cause impacts to other habitats that may be important as well.

Strategy 4: Preserving Existing Habitat In-kind in the Watershed of the Project Site. Many areas in the watershed are unprotected from habitat degradation; therefore, obtaining these areas and preserving them for existing habitat values would satisfy important habitat conservation needs. While this strategy ensures long-term preservation of the target habitat type, it does not provide no-net-loss acreage mitigation.

Strategy 5: Enhancing/Restoring Degraded Habitats Offsite in the Region. Many opportunities for habitat enhancement or restoration offsite have been identified. Private and public properties are located in adjacent watersheds that are degraded and have enhancement potential. While public lands are already protected, to some extent, from habitat degradation, habitats on private property are almost entirely unprotected and could be lost in the near future from agricultural, timber, or urban development. Many lands in the Sierra Nevada foothills have been cleared of oak woodlands and scrub vegetation to improve range (for grazing), harvest wood, plant crops, or build houses. These areas have the highest potential for restoration and greatest need for protection. Because large land areas are more efficient to manage than small parcels, private property adjacent to public lands should be given higher priority for acquisition to use for mitigation than other private parcels. Potential sites have been identified along the South Fork of the American River and along adjacent watersheds in the Yuba River and Cosumnes River drainages.

Strategy 6: Preserving High-quality Habitats Offsite in the Region. Many areas in the Sierra Nevada foothills outside the watershed are unprotected from habitat degradation; therefore, obtaining these areas and preserving them for habitat values would also meet important habitat conservation needs. Although this strategy ensures long-term preservation of the target habitat type, it does not provide no-net-loss mitigation.

In-Kind Habitat Value Replacement. Habitat losses could be replaced, in-kind, through in-canyon replacement following flooding (Adaptive Management Plan—Strategy 2), revegetation of offsite lands presently in rangelands dominated by nonnative grasses and forbs (Strategy 5), or a combination of the two. To attain the approximate value of the existing habitat, the replacement vegetation must replicate, to the extent practicable, the approximate composition, stand density, and structural diversity of the extant cover types. These were important variables used for calculating the HSI (Habitat Suitability Index) values for most of the evaluation species modeled in the original HEP study (for instance, western flycatcher, California quail, rufous-sided towhee, black-capped chickadee, and scrub jay).

These data represent a range of densities from 29 to 283 trees/acre for oak woodlands and from 33 to 179 trees/acre for conifer woodland. Higher initial planting densities have been selected to compensate for some mortality:

Xeric oak woodland	350 trees/acre and 150 shrubs/acre
Mesic oak woodland	350 trees/acre and 150 shrubs/acre
Conifer woodland	190 trees/acre and 150 shrubs/acre
Chaparral	260 shrubs/acre
Riparian woodland	400 trees/acre and 100 shrubs/acre

A proposed planting mix, density, and method of establishment for each species, by cover type, is discussed in the Incremental Analysis in appendix H.

Adaptive Management Plan (AMP). Adaptive management strategies are intended to use a project itself as a method to examine and/or refine ecological impact estimates that

are not reliably predicted using conventional preproject study techniques (Holling, 1978; Hilborn et al., 1980). Adaptive management strategies are recommended by the National Academy of Science for addressing the issue of uncertainty in estimating ecological effects (Orians, 1986; Johnston and McCartney, 1991). In this case, impacts over the project life can never be known with certainty because flood events are unpredictable. However, this approach does allow for the implementation of mitigation on an as-needed basis when actual losses occur. The purpose of the AMP for the detention dam is two-fold. First, it would establish a monitoring program to research the effects of periodic flooding in the American River canyon. This monitoring program would examine flooding effects on vegetation and permit the measurement of the effectiveness, applicability, and utility of mitigation measures and revegetation techniques. Measures that appear to work best can than be adopted for the entire inundation area if they are required. Second, the AMP would provide the mechanism to revegetate sites damaged or destroyed by flooding and provide for the partial recovery of habitat values in the exact locations of impact. The following discussion is intended as a general framework for the AMP. Further definition and refinement would be completed by an AMP team following project authorization.

The AMP could be implemented as a stand-alone project, or, as the Corps is doing with this project, combined with an off-site revegetation plan. The detention dam project is particularly suited for implementation of an AMP because of the level of uncertainty in inundation tolerance estimates. This uncertainty is due to the limited number of species and conditions that were able to be examined experimentally during the initial project planning phases. The Detention Dam Plan also provides the opportunity to integrate adaptive management strategies within the framework of the overall operation and maintenance program, which would permit mitigation and monitoring to be performed concurrently with other maintenance and repair activities following floods, as well as ensure a consistent funding base.

Project Monitoring. The AMP would be reviewed by a team consisting of the sponsoring and resource agencies to identify key variables and sites for monitoring, to test the underlying ecological principles involved in the assessment, and to determine appropriate monitoring techniques. The AMP team would identify the components of the plant communities and define degradation thresholds which would constitute a significant loss of visual resource and habitat values and warrant remedial action.

The AMP team would also establish a method for distinguishing between normal perturbations in the vegetative communities from those induced by periodic flooding. The team would also establish a system for estimating and apportioning remediation costs.

On an annual basis, the AMP team would review results of the current year's activities and scope any additional tasks required. In compliance with NEPA and CEQA regulations, the monitoring review team would report and distribute the findings of the mitigation and impact monitoring studies. The AMP would be reviewed periodically and objectives refined as necessary. Reviews would be made at least every 3 years or more often if flood or other major events significantly alter any plant communities in the project area.

Baseline Monitoring. The first phase of the monitoring program would be the collection of baseline data to determine existing/preinundation conditions. Low altitude, high resolution aerial photographs of the proposed inundation zone will be obtained to document baseline conditions. Prior to aerial photography, elevation monuments would be positioned at a number of locations to accurately determine ground elevations using standard photo analysis techniques. Using GIS, the existing vegetative communities would be delineated and areal coverage quantified. The aerial photographs will be taken in mid-summer at full canopy development.

Monitoring plots and transects of key vegetative communities would be established within the inundation zone. In addition, control plots representing the same vegetative communities would be established in areas outside of the inundation zone. All plots would be identifiable on aerial photographs and easily located for ground surveys. A permanent monument should be placed in the center of each plot and the location ($\pm$ 15 feet) of the monument determined with a hand-held GPS (global positioning system transponder). A minimum of three replicates for each of the vegetation communities would be established to represent variation in elevation, aspect, and the longitudinal profile of the canyon. Plot size would vary according to cover type. For example, oak woodland plots would be one-fifth acre in size to be consistent with historic sampling efforts (Allen et al., 1989).

Standardized vegetation sampling would be conducted at each plot to determine composition, density, frequency, dominance, diversity, importance value, age structure, physical structure (for instance, canopy height, cover, and stratification), and vigor of key vegetative indicator species within representative cover types. The baseline sampling would be repeated periodically throughout the first year to adjust for seasonal variation. Aerial photographic estimates of cover type, canopy closure, and areal coverage would be compared against ground sampling data to determine statistical correlations. The strength of the correlations would determine the limits of reliance on future aerial photography. Wildlife sampling would be conducted within monitor and control plots to determine species composition, density, diversity, and seasonal activity patterns. Dead and felled vegetation would be inventoried at sample plots to determine a rate of loss attributable to natural and/or nonflood-related causes (for instance, windthrow, slope instability, etc.).

Routine (Nonflood) Monitoring. At 3- to 5-year intervals, new sets of aerial photographs of the canyon and monitor and control plots would be obtained. The flightlines, date, and time of the photographs would be the same as the baseline photographs. The routine aerial photographs would be compared against baseline photographs to determine any changes in the areal extent of vegetation and canopy closure resulting from natural and nonproject effects. The monitor and control plots would be surveyed using the methods described for the baseline sampling to identify and document nonproject-related changes to vegetative communities and wildlife.

Postflood Monitoring. In the summer following significant canyon inundation, new sets of aerial photographs would be obtained in mid-summer immediately following the flooding season. Significant canyon inundation would be based on a minimum

duration of 4 days with a minimum water-surface elevation of 650 feet, msl. This roughly corresponds to approximately a 40-year recurrence flood. The mid-summer timing is to ensure that the floodflows have fully receded and protracted and residual vegetation impacts have had sufficient time to manifest. Ground surveys would be conducted to distinguish flood-induced impacts to vegetation and wildlife. These data would permit a comparison of preproject loss estimates with actual losses and permit new refined loss estimates based on real time, site-specific data. Based on postflood observations and analyses, previously employed mitigation measures would be monitored and evaluated to eliminate measures which are ineffective, supplement offsite land acquisitions if necessary, and incorporate new state-of-the-art measures for experimental purposes. Postflood monitoring would also facilitate the tracking of potentially cumulative impacts. Significant flood events would trigger a new cycle of monitoring and analysis.

Offsite Mitigation Plan. Estimates for conducting offsite oak woodland, mixed conifer forest, chaparral, and riparian restoration are based on the following assumptions:

Oak Woodland. Xeric and mesic oak woodlands would be established at sites that have been cleared for cattle range and currently are vegetated with nonnative annual grasses and forbs. The sites would be planted at the rate of 350 trees/acre (8 species) and 150 woody shrubs/acre (10 species). Oaks would be planted with three viable acorns/planting site. All plants would receive herbivory protection cages, and weed mats would be installed with staples around each planting hole to control weeds. No supplemental irrigation or fencing would be used.

Mixed Conifer Forest. Mixed conifer forest mitigation would be conducted at appropriate sites on relatively steep terrain. Bare-root seedlings or 4 conifer species would be planted at the rate of 130 trees/acre. Oaks (4 species) would be planted at the rate of 60 trees/acre. Shrubs (10 species) would be planted as seedlings at the rate of 150 shrubs/acre. Each planting spot would include herbivory protection cages and weed control mats. Plantings would not receive supplemental irrigation.

Chaparral. Chaparral mitigation would be conducted on relatively steep terrain with poor, rocky soils. Shrubs (10 species) would be planted at a rate of 260 shrubs/acre. The sites would not be fenced, and the plants would receive neither supplemental irrigation nor weed control.

Riparian. Riparian mitigation would be conducted at disturbed reaches along the Middle Fork of the American River or at offsite mitigation areas. Riparian tree species (8) would be planted at a density of 400/acre and shrubs (5 species) would be planted at a density of 100/acre. Combinations of cuttings (willows) and seedlings would be installed. Herbivory and weed protection would be installed, but no fencing or supplemental irrigation would be included.

Revegetation Program. The second function of the AMP would be to develop and implement the revegetation program within the canyon to rehabilitate areas damaged by flooding.

Mitigation

The adaptive management plan approach would involve replacing habitat after it is lost during a detention period. Implementing the adaptive management plan would require that the area behind the detention dam be surveyed after each detention episode to determine the damage to the vegetative community in the canyon. When a vegetative loss is identified, the extent would be delineated and the type of vegetation determined. An equivalent number of young individuals of each type of vegetation would be planted at the sites. The benefits of this mitigation strategy are that the mitigation would be accomplished at the location of the loss, and there would be no land acquisition costs. A significant concern about this approach over an offsite alternative is the possibility that vegetation planted after a flood may be lost or damaged by succeeding floods. To partially offset this possibility, the planting ratio has been increased to twice the number needed to compensate for losses.

To implement an adaptive management plan as mitigation, it would be necessary to manage approximately 1,481 acres of land bordering the North and Middle Fork channels over the project life. The methods to be used are described above.

To complete the mitigation required for project impacts, an additional 2,774 acres of canyonlands would be purchased adjacent to the Yuba River near Englebright Lake. These lands would be planted with appropriate native species.

ENDANGERED SPECIES

No-Action Condition

Operation of the detention dam would potentially affect the valley elderberry longhorn beetle (FT). The conditions in the project area which support this species have been previously described (see the Endangered Species discussions in chapters 4 and 6 and in appendix K.)

Significance Criteria

For purposes of this evaluation, any action taken directly in connection with, or indirectly caused by, the project which may affect the continued existence of a threatened or endangered species would be considered a significant adverse impact.

Impacts

The information provided in the 1991 ARWI EIS/EIR was based on habitat mapping of the American River canyon. The previous analysis was based on cursory field surveys which concluded that five shrubs per acre would be lost throughout the inundation zone. More recent detailed field surveys show that 210 shrubs with 2,336 stems greater than 1 inch are presently in the inundation zone. Locations of the shrubs are shown in the Endangered Species appendix Biological Data Report and Preliminary Section 7 Biological Assessment on the Valley Elderberry Longhorn Beetle, figure 4 (Montgomery Watson, 1995).

According to the Biological Data Report and Preliminary Biological Assessment on the valley elderberry longhorn beetle (appendix K) completed by Montgomery Watson, the lower bound of the mortality regression was based on data from the Pacific Northwest for blue elderberry. According to Walters et al. (1980), blue elderberry can withstand flooding for 1 to 3 months during the growing season. Because the longest duration predicted for the area above the dry dam is 28 days, it was assumed, based on these data, that limited mortality would result from inundation. This assumption is consistent with the interpretation that blue elderberry's inundation response is similar to that of willow and other low-terrace riparian trees and shrubs.

Operation of the detention dam could directly affect the shrub and indirectly the beetle by temporarily inundating portions of the North and Middle Fork canyons. The maximum inundation period is expected to be 28 days; it is possible that as many as 103 shrubs with 1,143 stems greater than 1 inch could be lost over the period of analysis.

Mitigation

Elderberry shrubs lost as a result of project operation would be replanted in-kind and onsite at a 3:1 replacement ratio in suitable areas along the upper American River in the adaptive management area. Because survey results show that most shrubs are found on the Middle Fork, a one-time replanting would be done here to guarantee the highest chance of survival and to replace all shrubs expected to be lost over the project life. Approximately 70 acres would be required for the plantings.

Compensation for the beetle would be provided as a project feature in accordance with FWS guidelines. The study concluded that 1,143 stems greater than 1 inch in diameter would be affected. At a 3:1 ratio, 3,429 seedlings would need to be established. For an expected mortality rate estimated to be 50 percent, 7,008 seedlings would be planted in the lands designated for adaptive management.

WATER QUALITY

No-Action Condition

Lower American River. Water quality along the lower American River is generally good to excellent for all beneficial uses. However, dissolved oxygen and temperature do not meet some beneficial objectives during low-water years when flows in the river are reduced. These low flows periodically result in high water temperatures that may jeopardize juvenile fish. Runoff from the portions of the lower American River area north of the river is collected and discharged into the American River. Runoff from areas south of the river is collected and discharged into the Sacramento River.

Upper American River. Water-quality management by the CVRWQCB (Central Valley Regional Water Quality Control Board) includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determined the overall water-quality objectives. The beneficial uses of the American River include:

Municipal and domestic supply	Warm freshwater habitat
Irrigation	Cold freshwater habitat
Stock watering	Spawning (warmwater)
Water contact recreation	Spawning (coldwater)
Canoeing and rafting	Migration
Noncontact water recreation	Wildlife habitat
Hydroelectric power generation	Riparian habitat

The primary beneficial uses in the vicinity of the project area include domestic water supply, contact and noncontact recreation, coldwater spawning, cold freshwater habitat, and wildlife habitat.

Significance Criteria

For the purposes of this analysis, any degradation of water quality below standards established by SWRCB or EPA would constitute a significant impact. For this analysis, 1994 EPA standards, D1485, and December 1994 Bay/Delta Standards were among the standards used as parameters to determine adverse effects to water quality in the lower American River and the Delta (see the Water Quality discussion in chapter 4 and Montgomery Watson, 1996).

Impacts

Lower American River. There would be no change in flows in the lower American River because the 20 sluices at the detention dam would allow flows for smaller storms to pass unimpeded into and through Folsom Reservoir. The flows greater than 25,000 cfs (out of the river channel) in the lower American River are unchanged for the 5-year storm

(3 days); 10-year storm (4 days); 20-year storm (5.5 days); and 100-year storm (15 days). For the 50-year storm, the flows greater than 25,000 cfs would be extended by about 12 hours; and for a 200-year storm, the release would last 21 days with a detention dam in place. Without the dam in place, flows would exceed the downstream levee capacity, resulting in a levee failure and flood in Sacramento.

For the smaller events, there would be no difference in the peak flows whether the dam is in place or not. Consequently, there would be no effect on downstream water quality. For the larger events, the same volume of water would pass through the system whether the dam is in place or not. In this instance, the peak flows are reduced and the duration extended. For the higher events (greater than a 100-year storm) the peak flows would exceed the levee capacity, resulting in levee failure and flooding. Should there be flows along the lower American River that resulted in levee overtopping or failure, water would flood the city both to the north and south. While there would be areas of deep ponding, eventually the water would return to the system south of Sacramento after flowing through the developed areas. These waters would pick a load of contaminants from the various industrial parks, sewage treatment facilities, and residential areas flooded. Waters flowing back into the system would deliver this contaminant load into the lower Sacramento River and the Delta. Hydrologic modeling using EPA and SWRCB standards showed that no significant increase in water temperatures would be realized (Montgomery Watson, 1996).

Upper American River. The effects of a 200-year sized detention dam on sediment transport were analyzed to help in the design of the dam and outlet configuration. This draft report (*Geomorphic, Sediment Engineering and Channel Stability Analysis, Resource Consultants and Engineering, 1993*) compared the base (no-action) condition to a detention dam with 12 sluice gates to learn how sediment would affect the sluices and gates. This study considered the quantity and size of the material being transported by the river. Where the material would likely be deposited during high flows under the base and project conditions was also evaluated. As a result of this study, the number of sluices has been increased from 12 to 20. Operation of the gates to control drawdown rates would significantly reduce sloughing associated with pool inundation.

The river in the study area is divided into a series of reaches between geologic or manmade features which restrict flows in the channel and cause bars to form from the bedload materials. On the Middle Fork, Reach 1 extends from the upstream limit of the project area at river mile 70.3 (near Oxbow Dam) to river mile 66.5; Reach 2 extends downstream to river mile 62.2, the upstream end of the pool caused by Landslide Rapid; Reach 3 consists of the pool behind Landslide Rapid and extends downstream to river mile 61.2 ; Reach 4 extends from Landslide Rapid to Greenwood Bridge at river mile 59.3; Reach 5 extends from Greenwood Bridge to the upstream end of the pool formed by Mammoth Bar at river mile 54.1; Reach 6 extends downstream to Murderers Gulch at river mile 52.4; Reach 7 extends from Murderers Gulch to the confluence with the North Fork at river mile 50.3; Reach 7a includes the North Fork up to North Fork Dam; Reach 8 is from the confluence and the damsite at river mile 47.2. Approximately 90 percent of the sediment

in the project area consists of medium to coarse gravels and cobbles; the remainder are divided between coarse sand, fine gravel, and boulders.

The study estimates that under "normal" conditions, approximately 14,500 tons of sediment is delivered as bedload on an average annual basis in the Middle Fork project area, and the North Fork delivers an additional 1,700 tons. One ton of this type of material contains approximately 2 cubic yards. The difference between the amount of sediment delivered by the two forks is a result of the North Fork Dam and Lake Clementine, which traps most of the sediment coming down the North Fork. A total of 16,900 tons is delivered past the damsite annually, showing that the system is degradational, losing approximately 700 tons annually. For detention dam conditions, the annual delivery from the North Fork is reduced to approximately 110 tons, and the amount passing through the dam sluices would be approximately 13,500 tons, indicating that the system would accumulate approximately 1,100 tons in the study area (Resource Consultants and Engineering, 1993).

During a 200-year storm, the relative sediment balance changes significantly. Approximately 560,000 tons of sediment would be delivered by the Middle Fork and approximately 270 tons would be delivered by the North Fork; of this total, approximately 265,000 tons would be carried past the damsite. This indicates that the project area is aggradational, accumulating about 295,207 tons during a 200-year storm without the dam in place. With a dam in place, the North Fork would deliver approximately 40 tons, and the amount passing the damsite would be 70 tons, increasing the aggradation to 560,000 tons. Given the tendency for material to accumulate upstream from constrictions such as Mammoth Bar and channel blockages such as Landslide Rapids, it is likely that sedimentation and bar formation would continue at the same general locations in the future with or without the project in place. (Resource Consultants and Engineering, 1993.)

The change in design and operation of the dam brought the without- and with-project conditions much closer, significantly reducing the effects of sedimentation on the aquatic environment and the limited fisheries resources in the project area. With a dam in place, sediment would be transported during the early part of a storm when the water is contained in the stream channel. As flows increase and the water begins to back up behind the dam, sediment in the water would start to settle out. When the storm passes and the drawdown begins, the flow rate would accelerate as the water returns to the channel. This acceleration of flows would again transport sediment downstream until the velocities were not sufficient to move the bedload. The second episode of sediment transport would somewhat cleanse the material deposited during the impoundment.

During February 1986, a 2-day average flow of 46,000 cfs was measured at the Foresthill gaging station, and water depths of 30 feet were noted at high-water marks on the canyon wall. Flows were estimated to have velocities of 20 to 25 feet per second. This storm was calculated to have a return frequency of about a 67-year storm. During a 200-year storm, it is calculated that peak inflows past the damsite would be about 300,000 cfs. Model runs indicate that this would result in water depths of approximately 60 feet. For a 400-year storm, peak inflows would be about 510,000 cfs and water depths

about 68 feet. Flows of this magnitude would likely result in all but the most sheltered fish being swept out of the river into Folsom Reservoir and would also cause the cobbles and sediment in the riverbed to move and be redeposited into new bars or at the existing bars along the river.

Downstream From American River. Hydrologic modeling using EPA and SWRCB standards showed no significant increase in water temperatures in the Delta. Therefore, no adverse effect would be anticipated.

Mitigation

No mitigation would be required because there would be no significant degradation of water-quality parameters in the canyon, along the lower American River, or downstream from the American River resulting from operation activities.

CULTURAL RESOURCES

No-Action Condition

The 894,000-acre-foot potential detention zone contains 17 prehistoric and 163 historic sites (table 9-3). Most of the 17 prehistoric sites consist of bedrock mortars, although a rock shelter, lithic scatter, and housepit could also be affected. Among the 163 historic sites are settlements, mining complexes (with evidence of machinery and structures), mined areas (mainly tailings, trenches, pits, and shafts), areas of structural development, bridges, check dams, ditch remnants, and miscellaneous areas such as roads, trails, and trash dumps. The mined areas are believed to be among the least likely to suffer major impacts (McCarthy, 1989).

TABLE 9-3

Archeological Site Impact Summary
Detention Dam Plan

Site Type	Below Confluence	North Fork	Middle Fork	Total
Historic	10	79	74	163
Prehistoric	2	8	7	17
Total	12	87	81	180

Significance Criteria

For the purposes of this analysis, impacts to cultural resources are considered significant if the affected property is a site, building, structure, or object which is recognized as culturally or historically significant based on the institutional, public, or technical criteria described in chapter 6 under Cultural Resources for the No-Action Alternative.

Impacts

Operation of the detention dam would not significantly affect data recovery to document the sites within the inundation zone because there would be no permanent impoundment of water behind the dam. However, periodic, temporary inundation of the canyon area could cause substantial site disturbance. Impacts from temporary inundation can include, but are not limited to, physical destruction by waves at varying elevations, bank lumping, and development of a new zone of frequent wet-dry cycling which enhances deterioration of some materials.

Under the No-Action Alternative, velocities associated with high riverflows could reduce the structural and historic integrity of the Mountain Quarries/No Hands Bridge. Periodic inundation of the canyon under the Detention Dam Plan is not expected to adversely affect the bridge and would likely maintain a higher degree of stability than the bridge would experience under the No-Action Alternative. Should it be necessary, the Western States Recreation Trail could be rerouted from the Mountain Quarries/No Hands Bridge to the crossing of the American River at the nearby, existing Highway 49 Bridge. Rerouting the trail for a short distance would maintain the functional qualities of the trail, and recreational use would not likely decrease. The North Fork Dam would withstand inundation.

The Highway 49 replacement alignment would be near five archeological sites and the historic Mountain Quarries/No Hands Bridge. It is possible that the new high bridge and the highway replacement could be constructed without any direct impacts to historic, prehistoric, or submerged resources by designing the alignment to avoid these. Impacts from visual intrusion to the Mountain Quarries/No Hands Bridge would be unavoidable. The Ponderosa Way Bridge is more than 50 years old, and it would need to be evaluated to determine eligibility for National Register listing.

There is a high potential for the loss of a number of historic sites during periodic inundation of the area behind the flood detention dam. This would be an unavoidable, significant impact which cannot be fully mitigated. The respect humans attribute to cherished places of their physical surroundings such as historic sites, open space, and the natural environment is considered to be almost universal (Hiss, 1990). Construction of a dam would intrude upon the quality of the historical setting and would detract from the public's visual and visual experience; however, the dam would not be visible from most areas.

Mitigation

No additional cultural resource surveys in the canyon area would be initiated by the Corps until after authorization of this plan. Impacts from temporary inundation, including wave action and a new zone of wet-dry cycling, could be reduced by data recovery, documentation, and structural protection, but not to a less than significant level. Visual impacts of the dam and Highway 49 replacement would be significant and unavoidable.

TRANSPORTATION

No-Action Condition

Upper American River. The Auburn area is partially urbanized with heavy traffic volumes passing along I-80 and north to Grass Valley and Nevada City by way of Highway 49, which conveys about 7,000 vehicles daily through the study area.

Significance Criteria

Three criteria were used to determine if project-generated traffic and transportation impacts would be significant. First, where project-added traffic volumes would contribute to or degrade any existing peak-hour intersection level of service (LOS) to LOS "D" or below, the project was considered to have a significant impact. Second, in instances where project traffic would create a substantial safety risk, this impact was considered significant. Third, where project vehicle weight would exceed roadbed design standards, potential impacts to road surfaces were considered.

Impacts

The Highway 49 Bridge would be relocated as part of this plan. The chosen alignment would be above the maximum pool elevation. No adverse effects would be expected.

Mitigation

No mitigation would be required.

HAZARDOUS AND TOXIC WASTE

No-Action Condition

The upper American River canyon was historically mined extensively for gold. At the present time, there are few remaining small operations, and none are regulated by the Central Valley Regional Water Quality Control Board. In the past, the bigger mines used

hydraulic methods to mine the gold. Hydraulic mining has been banned for decades because it was the source of significant sedimentation downstream." A review of the Regional Water Quality Control Board's Listing of Dischargers and conversation with board staff revealed no problem active mine, abandoned mine, or tailings within the project area. No acid mine drainage problem had been documented in the past. (Dan Fua, Department of Water Resources, pers. comm., November 14, 1991.)

A review of the geology of the project area revealed no significant deposit of acid-forming rocks such as pyrite in the upper American River. These deposits have been known to occur in the lower elevation of the Sierra foothills. The small pyrite deposits that may have been exposed by hydraulic mining in the upper American River have since been mineralized, such as at the Sliger Mine in the Middle Fork American River, and prevented from producing acid drainage.

Significance Criteria

For purposes of this analysis, any action which substantially increases the risk of an uncontrolled release of hazardous or toxic materials into the environment is considered a significant impact.

Impacts

Mercury levels are currently being evaluated in the Upper American River canyon as well as in other parts of the Sierra. Studies using bioindicators (trout and juvenile insects) have shown that the Middle and North Forks of the American River contain the lowest levels of mercury of all other studied Sierran streams or rivers (Slotton, pers. comm., January 9, 1996).

Temporary inundation of the canyon would not cause the release of methyl mercury. Methyl mercury formation requires anaerobic conditions for more than several weeks. The flood pool would not be inundated long enough to allow methyl mercury formation.

There are no known operations, past or present, that used cyanide to extract gold in the upper American River. (Dan Fua, DWR, pers. comm., November 14, 1991.) Since there would be no excavation of gravel bars and deposits in the project area, except for keying the dam foundation, there is no likelihood that any acid-forming rocks would be reexposed during the construction and operation of the project. (Dan Fua, DWR, pers. comm., November 14, 1991).

VISUAL RESOURCES

No-Action Condition

Visual resource values in the upper American River canyon area are high. Visual resource values in areas where construction work associated with dam construction, replacement of Highway 49, and reinforcing the Ponderosa Way Bridge is proposed are low due to construction disturbance from Reclamation's multipurpose dam.

Significance Criteria

For a project to have a significant adverse effect, the project or features of a project would change the visual quality of sensitive viewing components within the observable scene. A large number of viewers would notice a significant change to the character of the existing setting. Such changes may include a project feature significantly blocking a desirable viewing component or replacement of valuable environmental resources previously regarded as visual.

Impacts

Lower American River, Folsom Reservoir, Downstream From American River. There would not be any adverse effects to visual resources in these areas.

Upper American River. Adverse effects to visual resources behind the dam would be limited to those caused by extremely high precipitation and runoff events. The maximum elevation of water behind the dam during a 400-year storm would be 942 feet. Much of this area would be submerged. As impounded floodwater recedes, some sediment and floating debris would be deposited upstream from the dam, and become lodged behind trees, rock outcrops, and other obstacles. Over time, much of this debris would decompose and become covered by vegetation, steadily decreasing its visual prominence. No project-induced landslides are expected because the drawdown rate would be controlled by operable gates in the sluices of the dam. Although the canyon is not visible to a large number of viewers, the canyon is considered by many to be a valuable environmental resource. This is considered to be a significant, mitigable adverse effect to visual resources.

Mitigation

The adaptive management plan would mitigate for lost vegetation in the canyon area. Replanting of vegetation, in addition to the natural revegetation, would offset the degraded visual quality of the canyon area. In addition to the adaptive management plan described above, the non-Federal sponsor has made a commitment to secure the rights to plant in areas outside the mitigation area. Should there be a loss of vegetation in the areas more infrequently flooded during storms, the areas would be revegetated, ensuring that the canyon retains its current visual character.

CONSTRUCTION IMPACTS

LAND USE

No-Action Condition

The upper American River area encompasses portions of Placer and El Dorado Counties and includes the lands within and immediately around the damsite near Auburn ("canyon area") and the lands occupied by the surrounding communities. Most of the land in the canyon is owned by the Federal Government as part of the authorized multipurpose Auburn Dam project.

Significance Criteria

Land use impacts are considered significant if the project would cause a substantial long-term disruption of an existing or reasonably foreseeable future land use.

Impacts

The Detention Dam Plan would not affect land uses in the upper American River area due to construction, operation, and maintenance of the dam; relocation of Highway 49; and mitigation for the adverse effects of this activity. Land use patterns in the project area would not be affected by construction of the new bridge realignment and implementation of a fish and wildlife mitigation plan.

Mitigation. No mitigation is required.

RECREATION

No-Action Condition

Lower American River. Earthen levees 20 to 30 feet high border much of the lower half of the American River Parkway, blocking out surrounding urban development and activity. These physical barriers and extensive stands of mature riparian forest give the parkway a "wilderness in the city" quality. The Jedediah Smith Trail provides bicycle, pedestrian, and equestrian trails from Discovery Park to Folsom Reservoir and is one of the parkway's most popular features. The trail also connects with the Sacramento River Trail and Old Sacramento Historic Park. The 23 miles of river below Nimbus Dam is included in both the State and Federal wild and scenic river systems.

Folsom Reservoir. Folsom Reservoir supports numerous water-based activities such as boating, waterskiing, and fishing. The shoreline provides sandy swimming beaches, both formal (with lifeguard services) and informal. Surrounding Folsom Reservoir is a landscape

with important scenic, natural, and cultural values. Recreational facilities include camping and picnic areas, boat launch ramps, restrooms, concessions, bicycle and mountain bike trails, and equestrian trails and staging areas.

Upper American River. Reclamation contracted with the Department of Parks and Recreation to provide recreation and public-use management services on the lands within the boundaries of the multipurpose Auburn Dam project, known as the Auburn State Recreation Area. The recreation area includes 42,000 acres and 48 miles of the North and Middle Forks of the American River extending from the damsite to the Iowa Hill Bridge on the North Fork and Oxbow Reservoir on the South Fork. The reach of river just upstream from the damsite is currently closed to recreation use.

Its nearness to major population centers and diverse recreation base make the Auburn State Recreation Area one of the most used and significant recreation resources in northern California. Bicycling has increased dramatically in the area. There is continuing demand for equestrian trails and other trails. Approximately 72 miles of hiking trails, 66 miles of equestrian trails, and 15 miles of fire road are open to mountain bikes in the recreation area and provide year-round recreation opportunities.

The trails and roads include Manzanita Trail, Middle Road Trail, Pointed Rock Trail, Old Quarry Road Trail, Tinkers Cuttoff, Old Stage Road, Old Auburn-Foresthill Road, a number of other trails, and many mountain bike trails. Additionally, the Western States Trail has been included as the trans-Sierra route of the proposed coast-to-coast American Discovery National Trail.

The Department of Parks and Recreation has the responsibility for maintaining these trails; due to budget constraints, the only maintenance accomplished is by volunteer workers, usually associated with the Western States Endurance Run.

Downstream From American River. Recreation along the Sacramento River is almost exclusively water-related.

Significance Criteria

Impacts to recreational resources were considered significant if construction would cause substantial long-term disruption to an existing recreational activity which is institutionally recognized.

Impacts

Lower American River. During construction of the slurry wall, users of the portion of the American River bike trail that extends along the roadway atop the levee would experience a short-term disruption.

Folsom Reservoir. No construction would be required at Folsom Reservoir under this plan. No adverse effects would be expected.

Upper American River. The Detention Dam Plan would have no significant adverse effect to recreational resources in the upper American River canyon. The dam structure would obstruct movement from one side of the damsite to the other. However, no impact to rafting would be experienced because rafting is prohibited from the confluence of the North and Middle Forks to below the damsite.

Downstream From American River. The levee work along the Sacramento River would not interfere with recreation associated with the Sacramento River, as the work would be done exclusively along the landward levee slope. No impacts to recreation are expected as a result of this work.

Mitigation

Lower American River. Mitigation for recreation impacts would include the installation of guide signs to route recreation traffic around construction areas.

Upper American River. There would be no mitigation required because the dam construction would not affect recreation uses in the area.

FISHERIES

No-Action Condition

Fish species that are year-round residents of the North Fork include smallmouth bass, bullhead, sunfish, riffle sculpin, Sacramento sucker, and Sacramento squawfish. Historical records of the Middle Fork fishery are limited. Rainbow and brown trout are stocked yearly. Resident fish species of the Middle Fork include Sacramento hitch, Sacramento sucker, Sacramento squawfish, riffle sculpin, brown trout, and rainbow trout. Fishery No-Action Conditions of the lower American River and Folsom Reservoir are discussed under the Folsom Modification Plan.

Significance Criteria

For purposes of this evaluation, fisheries impacts were considered significant if construction of the project would substantially interfere with the movement of any resident or migratory fish, substantially diminish habitat for fish, or involve discharges of material which pose a hazard to fish.

Impacts

Lower American River. The construction of 24 miles of slurry wall would not affect the fisheries, since the work would be done away from the river or any other water source. Based on the limited scope of the work and the temporary construction effort, impacts from slurry wall construction would not be significant to fish.

Upper American River. There would be no impacts to fisheries in the upper American River from construction activities to build the dam. However, if best construction management practices are not adhered to, fishery resources could be adversely affected by the increased turbidity resulting from construction associated with reinforcing the Ponderosa Way Bridge. Dam and access road construction would not affect fishery resources in the area because the construction site would be bypassed by the existing diversion tunnel. Relocation of Highway 49 would not adversely affect fishery resources in the area because construction would take place approximately 500 feet above the riverbed.

Mitigation

Any adverse impacts to fishery resources would be mitigated by implementing the water-quality requirement for construction activities.

VEGETATION AND WILDLIFE

No-Action Condition

Habitat at the proposed damsite includes seven specific cover types: south-slope oak woodland, north-slope oak forest, chaparral, nonnative (naturalized) annual grasslands, conifer forest, montane riverine, and rocky/ruderal. Conditions for the lower American River area and the area downstream from the American River are presented in chapters 7 and 8 under the sections discussing construction impacts to vegetation and wildlife.

Significance Criteria

For purposes of this analysis, impacts were considered significant if construction of the project would substantially interfere with the movement of any resident or migratory wildlife species, substantially diminish habitat for wildlife plants, or involve the disposal of material which could pose a hazard to wildlife or plant populations.

Impacts

Lower American River. The construction of 24 miles of slurry wall would cause minimal adverse effects to scattered grass areas along the fringes of the levee crown. The operation of construction equipment could cause a short-term disturbance to wildlife. Based on the limited scope of the work and the temporary construction, impacts from slurry wall construction to vegetation or wildlife would not be significant.

Upper American River. A total of 313 acres of vegetation would be affected in the upper American River area as a result of dam and access road construction and the replacement of Highway 49. Approximately 73 acres of oak woodland, 39 acres of riparian habitat, and 201 acres of nonnative grasslands would be removed to complete construction at the damsite, which includes clearing the damsite footprint, excavating for dam foundation and abutments, and pouring concrete for the foundation and dam construction. The excess material from excavation would be placed in two areas—the existing foundation keyways and the Salt Creek boat ramp area. No impacts to vegetation are expected from this disposal, since the margins of the boat ramp are sparsely vegetated in nonnative grasses and ruderal forbs. A thin stringer (less than one-fourth acre) of riparian shrub-scrub has invaded the cracks in the concrete along the west keyway. The loss of this minimal acreage of riparian shrub-scrub and nonnative grassland/ruderal land would not constitute a significant impact.

Construction of the detention dam would require approximately 6.8 million cubic yards of aggregate. Vegetation loss would be minimal because the aggregate would be taken either from cofferdam material or from an underground mine immediately downstream from the dam. The only loss of vegetation would be in the area excavated to form the mine entrance portals. Each portal, with two portals at each of three benches for a total of six portals, is 40 feet wide by 23 feet high. Each portal would be separated by 40 feet. The headwall at each bench would be 50 feet high from the bottom of the portals. Each of the three benches would be about 260 feet long and 90 feet wide. The access road would be about 20 feet wide. (See figure 9-1.)

The replacement of Highway 49 would result in adverse effects due to clearing for staging areas, permanent roadway and bridge abutment areas, areas under the bridge which have less than 50 feet of clearance, construction access roads, and the construction of the piers. No borrow or disposal areas are required. Reinforcement of the Ponderosa Way Bridge would not adversely affect vegetation or wildlife because all work would be confined to the existing bridge site.

Mitigation

The mitigation plan to compensate for vegetation and wildlife adversely affected by construction is incorporated into the project mitigation plan presented earlier in this chapter.

ENDANGERED SPECIES

No-Action Condition

Construction of the features included in the Detention Dam Plan would potentially affect the State-listed threatened Swainson's hawk. The conditions in the project area which support this species have been previously described (see Endangered Species discussions in chapters 4 and 6 and in appendix K).

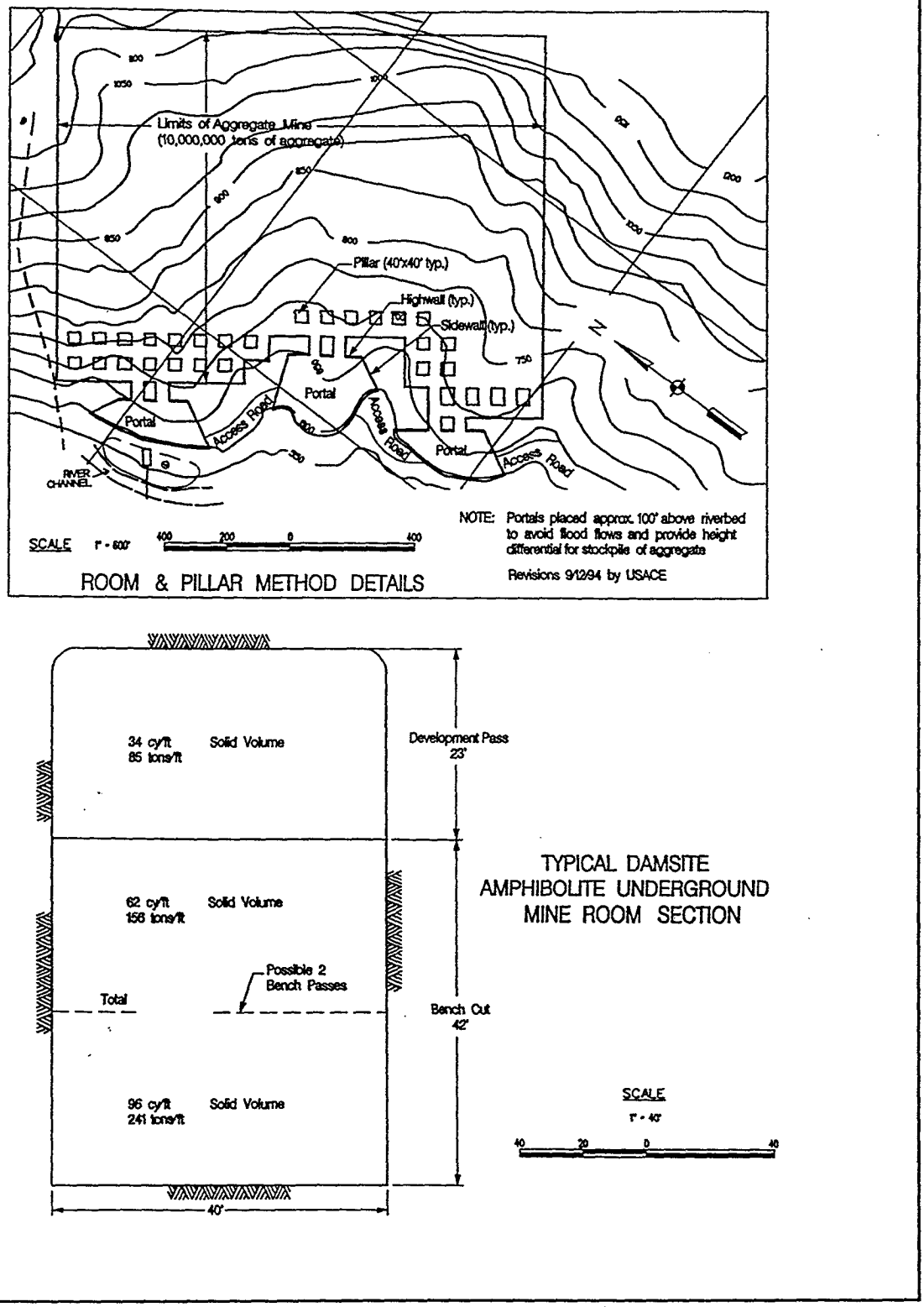

Figure 9-1. Typical Damsite Amphibolite Underground Mine Room Section.

Significance Criteria

For purposes of this evaluation, any action taken directly in connection with, or indirectly caused by, the project which may affect the continued existence of a threatened or endangered species is considered a significant adverse effect.

Impacts

Downstream From American River. Swainson's hawk potentially nest near construction areas along the Sacramento River east bank levee. If active nests are near construction activity, the hawks could abandon the nests, resulting in losses to the species. Suitable nesting habitat is adjacent to the construction area. Historical nests for State-threatened Swainson's hawk have been documented in the project vicinity. Nesting Swainson's hawk could be affected in this area.

Mitigation

To avoid effects to the Swainson's hawk, the Corps would implement seasonal restrictions on construction activity according to DFG guidelines for mitigating effects on the Swainson's hawk (DFG, 1994).

WATER QUALITY

No-Action Condition

Lower American River. Water quality along the lower American River is generally good to excellent for all beneficial uses. However, dissolved oxygen and temperature do not meet some beneficial objectives during low-water years when flows in the river are reduced. These low flows periodically result in high water temperatures that may jeopardize juvenile fish. Runoff from the portions of the lower American River area north of the river is collected and discharged into the American River. Runoff from areas south of the river is collected and discharged into the Sacramento River.

Upper American River. Water-quality management by the CVRWQCB includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. The beneficial uses of the American River include:

Municipal and domestic supply	Warm freshwater habitat
Irrigation	Cold freshwater habitat
Stock watering	Spawning (warmwater)
Water contact recreation	Spawning (coldwater)
Canoeing and rafting	Migration

Noncontact water recreation	Wildlife habitat
Hydroelectric power generation	Riparian habitat

The primary beneficial uses in the vicinity of the project area include domestic water supply, contact and noncontact recreation, coldwater spawning, cold freshwater habitat, and wildlife habitat.

Significance Criteria

For the purposes of this analysis, any degradation of water quality below standards established by SWRCB or EPA would constitute a significant impact.

Impacts

During construction of the detention dam, material would be removed from the riverbed to reach bedrock. Suitable material would be crushed and mixed into the concrete and used to construct the dam structure. The unsuitable material would be placed in disposal areas in the old keyway or near the Salt Creek boat ramp. This work would be accomplished during the summer low-flow period, and the river would continue to flow through the existing diversion tunnel.

The aggregate would be extracted from a new quarry proposed 100 feet above the river and immediately downstream from the damsite on the left bank. The quarry would be excavated into the canyon wall as a cave. Material would be delivered to the mixing plant, which would be located in the riverbed 100 feet downstream from the damsite. All the construction activities would be conducted in a manner that would avoid introducing sediment or contaminants into the river. All work would be in compliance with the guidelines promulgated pursuant to Section 404(b)(1) of the Clean Water Act.

Construction of the proposed Highway 49 relocation would affect approximately 27 acres of upland habitat which could be subject to erosive forces if not properly protected by reseeding or other appropriate method. This work would also be accomplished during the summer when there is little or no rainfall.

Mitigation

Direct impacts from sedimentation and incidental spillage would be minimized or avoided by continuing to divert natural streamflows from the active construction sites. This would make construction easier in the dewatered channel and would minimize contact of potentially harmful materials with the river. The damsite has a diversion tunnel in place from Reclamation's previous construction at river mile 47.2. Installing a network of temporary interceptor dikes and ditches at construction sites would convey sediment-laden flows into temporary settling basins. These basins would retain the waters and allow sediments to settle. Finally, certain construction activities would be limited to annual low-flow periods. The release waters from the construction site are regulated by CVRWQCB.

Selected water-quality parameters (Ph, dissolved oxygen, and turbidity) should be regularly monitored during construction.

No mitigation would be necessary because, typically, construction requires the use of containment barriers, fences, or dikes described above. All work would be accomplished during low-flow periods and generally well away from flowing water. No mitigation is required because there would be no significant degradation of water-quality parameters in the area resulting from construction activities and all work is in compliance with the guidelines promulgated pursuant to Section 404(b)(1) of the Clean Water Act.

CULTURAL RESOURCES

No-Action Condition

The damsite has been extensively modified by construction activities associated with Reclamation's multipurpose dam. The No-Action Conditions for the lower American River and the area downstream from American River are the same as the No-Action Conditions for the Folsom Modification Plan.

Significance Criteria

The significance criteria for all project areas potentially affected by the Detention Dam Plan are discussed in chapter 6, the No-Action Alternative.

Impacts

Lower American River. The cultural resources inventory of the lower American River Area of Potential Effect focused only on direct impact areas relating to construction of a slurry wall along a 24-mile-long corridor of the American River from Nimbus Dam to its confluence with the Sacramento River. Construction of the slurry wall is not expected to significantly affect cultural resources along the lower American River.

Upper American River. The flood detention dam would be built near the site of Reclamation's authorized multipurpose dam. Because the damsite has already been extensively modified by construction, no further impacts to cultural resources are expected. However, significant sites could be disturbed as a result of construction in project areas away from the damsite.

Downstream From American River. Proposed levee strengthening and raising activities along the landside berm of the Garden Highway (River Levee) bordering the Sacramento River between river miles 66.8 to 78.9 has the potential to affect a number of prehistoric and historic sites. Further analysis of project impacts is required before a more accurate assessment can be made.

Mitigation

A cultural resources PA (programmatic agreement) has been developed and adopted between the Corps, the Office of Historic Preservation, and the Advisory Council on Historic Preservation regarding implementation of the ARWP. Other signatories of the PA include the Bureau of Reclamation, Mid-Pacific Region; The Reclamation Board of the State of California; and the SAFCA. This PA will be used to complete Section 106 responsibilities for the wide range of related Federal actions expected to be carried out in connection with the ARWP. The PA includes procedures for treatment of indirect and direct impacts of the levee improvements associated with the detention dam. The executed PA specifies inventory (Stipulation 2) and National Register evaluation procedures (Stipulation 3) for historic properties, as well as the process for development of Historic Properties Treatment Plans (Stipulation 4). Additionally, report format and review (Stipulation 5), participation of interested persons (Stipulation 6), curation of recovered data (Stipulation 7), and professional qualifications (Stipulation 8) are also detailed.

As specified in the Corps' 1991 ARWI EIS/EIR, mitigation measures may include archeological documentation, architectural and engineering documentation, and historical documentation, following standards and guidelines adopted by the Secretary of the Interior (FR 48:190). No further cultural resource surveys in the canyon area would be initiated by the Corps until following authorization of this plan.

AGRICULTURAL/PRIME AND UNIQUE FARMLANDS

Construction related to this alternative would not affect any farmlands in the project area.

HAZARDOUS AND TOXIC WASTE

No-Action Conditions

The No-Action Condition is the same as described under Operational Impacts of the Detention Dam Plan.

Significance Criteria

For purposes of this analysis, any action which substantially increases the risk of an uncontrolled release of hazardous or toxic materials into the environment is considered a significant impact.

Impacts

There is a potential that hazardous or toxic substances could be released into the upper American River area during the activities related to construction of the flood control project.

Hazardous or toxic materials, such as gasoline, diesel, and oil needed to run construction equipment, would be controlled at the construction site. Contractors would be required to submit a plan for the proper handling and management of these hazardous materials to prevent accidents that threaten the safety of workers as well as the water quality of the American River.

Mitigation

Control of hazardous or toxic materials, such as gasoline, diesel, and oil needed to run construction equipment, would be necessary at each construction site. Contractors would be required to submit a plan for the proper handling and management of these hazardous materials to prevent accidents that threaten the safety of workers as well as the water quality of the adjacent waterways. The following describes mitigation measures needed to prevent substantial release or spill of toxic materials at construction sites and reduce potential impacts to a less-than-significant level.

Access. Restrict public access to construction sites to prevent access for dumping and vandalism which could result in the release of toxic materials.

Potential Onsite Contamination. An assessment to further evaluate the potential for existing onsite contamination at each construction site would be accomplished prior to construction. Subsurface sampling would be conducted to evaluate the magnitude of contamination. A review of existing environmental records with the Department of Toxic and Substance Control and the EPA would be conducted. Such a review would help identify where hazardous materials may have been dumped in the levee improvement areas and in the upper American River area.

If stained soil or other indications of hazardous materials are found during construction, all work would be stopped. The suspect soil or liquids should be analyzed and disposed of appropriately at an approved disposal facility.

TRANSPORTATION

No-Action Condition

Upper American River. The Auburn area is partially urbanized with heavy traffic volumes passing along I-80 and north to Grass Valley and Nevada City by way of Highway 49, which conveys about 7,000 vehicles daily through the study area. Access to the damsite is available from numerous dirt roads constructed to accommodate

reconnaissance investigations for Reclamation's previously authorized multipurpose project. These roads are gated, unimproved, and infrequently used and carry correspondingly low traffic volumes.

Downstream From American River. The Garden Highway is a two-lane highway generally used by local traffic only. Recreation access to the Sacramento River is a secondary use of the road.

Significance Criteria

Three criteria were used to determine if project-generated traffic and transportation impacts would be significant. First, where project-added traffic volumes would contribute to or degrade any existing peak-hour intersection level of service (LOS) to LOS "D" or below, the project was considered to have a significant impact. Second, in instances where project traffic would create a substantial safety risk, this impact was considered significant. Third, where project vehicle weight would exceed roadbed design standards, potential impacts to road surfaces were considered.

Impacts

Upper American River. Construction aspects of the dam, including concrete placement, disposal of unsuitable aggregate materials, reinforcement of the Ponderosa Way Bridge, and the replacement of the Highway 49 Bridge, would result in a number of short-term transportation impacts in the Auburn area. Dam construction and disposal activities are expected primarily at the damsite.

Some materials other than aggregate would have to be transported to the damsite over public roads. The use of large slow-moving trucks could cause significant capacity-related conflicts, particularly if construction vehicles operate during peak traffic periods. In addition, some construction vehicle routes may lack adequate turning radii, and heavy equipment could damage road surfaces. However, contractors would be required to conform to local regulations and load limitations on all roadways; therefore, these transportation impacts are considered less than significant.

Material would be moved to the proposed disposal sites over existing dirt access roads. This traffic would not use local roadways and thus would not affect local roadways except during transport of required equipment to the project site. Some material would be moved by rail. This would be underground and only be used during daylight hours. Construction activities related to the railhead area would be limited to daylight hours when residents would be less likely to be disturbed. This would be a short-term adverse effect which would not be mitigated.

Likewise, construction of a new Highway 49 Bridge would create additional construction-related vehicle trips along the existing roadway and in the Auburn area. Under the Detention Dam Plan, this bridge would be placed at river mile 49.1, a location which

retains, to the extent feasible, the existing alignment of the highway while ensuring that the roadway is high enough to satisfy State gradient requirements and permit clearance of the maximum inundation level of the flood detention dam. During construction, access would continue to be provided via a detour along the existing alignment; however, some delays beyond those currently experienced would occur where the new alignment departs the existing alignment. These delays, however, would occur over the short term and be intermittent and of short duration. Consequently, impacts to transportation are considered less than significant.

As explained in chapter 10, the Detention Dam Plan alignment has been selected as in-kind replacement for the Highway 49 Bridge. The State of California has indicated it would conduct route adoption studies. These studies may lead to the selection of an alternate alignment based on the long-term transportation needs of the area independent of the flood control project.

Downstream From American River. The stabilization and raising of levees along the Sacramento River would result in periodic closure of the Garden Highway and could cause increased truck traffic on roads near the construction staging area. Additional traffic would result during transport of borrow material to the construction sites. The contractors would comply with existing limitations on all access roads. No significant adverse effects are expected.

Mitigation

To reduce the direct construction impacts associated with the various project alternatives in all project areas, the following measures would be implemented:

- Contractors would avoid public roads when hauling materials to construction sites. If this is not feasible, contractors would prepare a transportation plan with information on haul routes and the number of trucks per day, as well as a traffic engineering analysis indicating that potential affected intersections have adequate turning radii for oversized vehicles.

- Contractors would avoid hauling on public roads during weekday peak traffic periods, such as 6:30 to 9:30 a.m. and 3:30 to 6:30 p.m., especially in developed areas. If this is not feasible, contractors would prepare traffic engineering studies to include peak-hour capacity calculations at affected intersections along haul routes, demonstrating that acceptable levels of service would be maintained. These studies would be prepared for the Corps and would conform to appropriate local standards. Contractors would also allow pertinent agencies and concerned neighborhoods to comment on the transportation plan and traffic engineering studies. Where construction access was by local roads, residents would receive prior notification.

- Traffic would be rerouted to avoid construction areas.

AIR QUALITY

No-Action Condition

The upper American River portion of the project area is in the Mountain Counties air basin, under the jurisdiction of the Placer County Air Pollution Control District. All of Placer County, except that segment in the Lake Tahoe air basin, has been designated as a nonattainment area for ozone and unclassified for PM10.

Because of the direction of prevailing air currents and the action of the Sierra range as a climatological barrier, the Auburn area is subject to heavy influence from air contaminants originating in the Sacramento area, as well as from agricultural burning activities in the valley. Traffic on I-80 and Highway 49 and local industries are also significant sources of air pollution.

Significance Criteria

According to appendix G of the State CEQA Guidelines, a project will normally have a significant effect on the environment if it will violate any ambient air-quality standard, contribute substantially to an existing or projected air-quality violation, or expose sensitive receptors to substantial pollutant concentrations.

Significance criteria developed by the SMAQMD and by the EPA were used in determining the significance of project-related air-quality impacts. Project-related emissions were considered significant if emissions exceeded the SMAQMD's thresholds of:

- 85 pounds per day (ppd) of ROG,
- 85 ppd of NO_x, or
- 275 ppd of PM10 (Sacramento Metropolitan Air Quality Management District, 1994).

Also, project-related annual emissions were considered significant if emissions exceeded EPA's general conformity thresholds. Those conformity thresholds are based on the de minimis thresholds included in EPA's general conformity guidance regulation for the Sacramento area (40 CFR Part 51 Subpart W and 40 CFR Part 93 Subpart B). The threshold levels equal:

- 25 tons per year for ROG
- 25 tons per year of NO_x,
- 100 tons per year for CO, or
- 100 tons per year for PM10.

Impacts

Under the Detention Dam Plan, emissions would be produced during construction of the detention dam and from raising and strengthening levees along the lower American River and the Sacramento River. Emissions from dam construction would include fugitive dust from aggregate mining, processing, and transporting and exhaust emissions produced by a variety of heavy-duty construction equipment. A segment of Highway 49 in Placer and El Dorado Counties would have to be relocated. This relocation would also produce air emissions. A 6-year construction period would be required for all major construction in the American River canyon. The new segment of Highway 49 would slightly reduce travel times in portions of Placer and El Dorado Counties, affecting mobile source emissions in these areas.

Table 9-4 summarizes annual CO, ROG, NO_x, SO_x, and PM10 emissions for the Detention Dam Plan. Emissions would exceed the daily emission thresholds for ROG, NO_x, and PM10 and the annual emission threshold for ROG, NO_x, and CO. This is considered a significant impact.

Upper American River. Emissions from dam construction would include fugitive dust from aggregate mining, processing, and transporting and exhaust emissions produced by a variety of heavy-duty construction equipment. Air-quality modeling has shown that construction emissions of NO_x would exceed the threshold level by 100 to 125 tons and emissions of ROG would exceed the threshold level by 10 to 15 tons. CO emissions are within threshold levels. In addition, the new segment of Highway 49 would slightly reduce travel times in portions of Placer and El Dorado Counties; this would not significantly affect mobile source emissions in these areas.

Lower American River. Emissions along the lower American River would be generated from construction activities involved in raising and strengthening existing levees. All emissions are within the threshold levels.

Folsom Reservoir. The proposed action would not generate any air emissions in the Folsom Reservoir area.

Downstream From American River. Emissions along the lower Sacramento River would be generated from construction activities involved in raising and strengthening existing levees along the Sacramento River. Table 9-4 summarizes annual CO, ROG, and NO_x for all areas of construction. Emissions are within threshold levels along the lower Sacramento River.

Mitigation

(1) Prepare and Implement a Dust Suppression Plan

The Corps would prepare a dust suppression plan and submit it to the SMAQMD/Placer County Air Pollution Control District/El Dorado County Air Pollution Control District for review before initiating construction. The plan would include as many of the following mitigation measures as are applicable to each project site:

- Cover, enclose, or water active storage piles at least twice daily.
- Cover inactive storage piles.
- Pave all haul roads.
- Cover securely or maintain at least 2 feet of freeboard on all haul trucks when transporting material.
- Water all active construction sites at least twice daily. Frequency should be based on the type of operation, soil, and wind exposure.
- Maintain the natural topography to the extent possible to eliminate the need for extensive land clearing, blasting, ground excavation, grading, and cut-and-fill operations.
- Prohibit all grading activities during periods of high wind (greater than 30 miles per hour).
- Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least 4 consecutive days).
- Apply nontoxic binders (for example, latex acrylic copolymer) to exposed areas after cut-and-fill operations and hydroseed area.
- Plant tree windbreaks on the windward perimeter of construction projects if they are adjacent to open land.
- Plant vegetative ground cover in disturbed areas as soon as possible.
- Install wheel washers for all exiting trucks.
- Sweep streets if visible soil material is carried onto adjacent public roads.

TABLE 9-4

Construction Equipment Emissions
Detention Dam Plan

Year	Carbon Monoxide CO		Reactive Organic Compounds ROG		Nitrogen Oxides NO_x		Sulfur Oxides SO_x		Inhalable Particulate Matter PM10	
	Tons per Year	Pounds per Average Work Day	Tons per Year	Pounds per Average Work Day	Tons per Year	Pounds per Average Work Day	Tons per Year	Pounds per Average Work Day	Tons per Year	Pounds per Average Work Day
2000	250	2,676	38	268	619	5,394	61	581	116	1,601
2001	241	2,917	37	307	598	6,016	59	650	114	1,647
2002	149	2,573	25	268	372	5,185	34	558	99	1,345
2003	151	3,057	19	364	358	7,197	38	776	101	1,470
2004	148	2,687	19	340	351	6,286	38	679	100	1,413
2005	153	2,939	18	351	358	6,902	38	743	101	1,449
2006	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	30	570
2008	0	0	0	0	0	0	0	0	30	467
2009	0	0	0	0	0	0	0	0	30	386
2010	0	0	0	0	0	0	0	0	0	0
Maximum	250	3,057	38	364	619	7,197	61	776	116	1,647

- Post a publicly visible sign at the project site to specify the telephone number and person to contact regarding complaints. This person shall be responsible for responding to complaints and taking corrective action within 48 hours.

(2) Control Dust Emissions from Aggregate Mining

Aggregate mining would generate emissions from rock mining, crushing, screening, and conveying. Several of these activities would require a permit from the Placer County Air Pollution Control District. The following measures should be implemented to minimize emissions from aggregate mining. For the underground mining operations, the ventilation exhaust should be fitted with a fabric filter and/or a fog or water spray system to control dust releases. For the aboveground aggregate conveyor system, the conveyor should be enclosed to minimize dust generation. All aboveground aggregate transfer points should include a water spray system to control dust releases.

(3) Incorporate NO_x mitigation measures into construction plans.

- Require injection timing retard of 2 degrees on all diesel vehicles, where applicable.
- Install high-pressure injectors on all vehicles, where feasible.
- Encourage the use of reformulated diesel fuel,
- Use Caterpillar prechamber diesel engines (or equivalent) together with proper maintenance and operation.
- Electrify equipment, where feasible.
- Maintain equipment in tune with manufacturer's specifications, except as otherwise stated above.
- Install catalytic convertors on gasoline-powered equipment.
- Substitute gasoline-powered for diesel-powered equipment, where feasible.
- Use compressed natural gas or onsite propane mobile equipment instead of diesel-powered equipment, where feasible.

<u>Air-Quality Conformity</u>

The Detention Dam Plan is potentially subject to both the general and transportation conformity regulations. The applicability of the transportation conformity rule arises from relocation of Highway 49 in Placer and El Dorado Counties. Reconstruction of bridges (such as the Howe Avenue Bridge) is exempt from the transportation conformity requirements.

Currently, the Detention Dam Plan emissions are not included in SACOG's implementation plan (Young, pers. comm., 1995). This is considered a significant air-quality impact.

The Corps should submit the Highway 49 relocation project to SACOG for incorporation into the MTIP (Metropolitan Transportation Improvement Program). Once the relocation project has been incorporated into the MTIP, SACOG would be required to show that the MTIP conforms to the Sacramento Metropolitan Area's State Implementation Plan. This mitigation measure would reduce the impact to a less-than-significant level.

As shown in table 9-4, emissions associated with the Detention Dam Plan exceed the tons per year conformity thresholds established by the EPA. Consequently, a conformity analysis has been conducted and is attached in appendix L. The determination of conformity found that ROG and NO_x emissions were above threshold levels. In order to mitigate, the non-Federal sponsor would secure appropriate emission offsets prior to construction of the project.

For this project, the first reporting requirement under general conformity would be issued after project authorization but prior to construction. If the NED plan does not change before the project is authorized, then the conformity determination would be used to satisfy the first reporting requirement. If the NED plan is changed prior to project authorization, then the draft conformity determination would have to be revised accordingly.

The second reporting requirement requires that the Federal agency making the conformity determination notify the same agencies 30 days after making a final conformity determination. This final conformity determination cannot be issued until all mitigation measures and emission offsets have been secured.

The conformity rule also contains specific public participation requirements, consisting of draft and final noticing provisions. Those provisions require that, upon request by any person, the responsible Federal agency make the draft conformity determination available for public review. The Federal agency must make public its draft conformity determination by providing 30 days for written public comment before taking any formal action on the draft determination.

The Federal agency must document all responses to comments received on its draft conformity determination and make those comments and responses available, upon request by any person, within 30 days of the final conformity determination. The final conformity determination must be made public by advertisement in a local daily newspaper.

NOISE

No-Action Condition

Upper American River. Noise levels are relatively low in El Dorado and Placer Counties where dam construction, replacement of Highway 49, and reinforcing the Ponderosa Way Bridge are proposed. Noise levels in nearby communities are typical of low density urban areas and are primarily traffic related. Other noise sources include sounds produced from the river current, birdsong, and recreational users.

Downstream From American River. Existing adjacent uses at the areas downstream from the American River include waterside recreational uses and residential uses. The ambient background levels range from 51.1 to 61.6 dBA. Structures are within 20 to 100 feet of some construction sites.

Significance Criteria

The significance criteria used to evaluate anticipated noise conditions are based upon project-related incremental noise increases at the construction sites. Noise from construction activities were compared to the city's criteria for nontransporation-related noise sources. An increase in noise of 3 dB or less is typically not perceptible, while a 5 dB increase is usually perceived as being distinctly perceptible. Consideration was given to the magnitude of the change in assessment of significance.

Noise impacts were assessed at each of the sites by comparing project-generated construction and operational noise levels, existing noise levels, and the criteria and standards contained in applicable planning documents. The criteria applicable in this case are primarily for noise-sensitive residential uses and are intended to provide a suitable environment for indoor communication and sleep. The noise standard which would apply to each project improvement site is contained in the General Plan Noise Element for that respective jurisdiction. All respective noise elements cite 60 dBA L_{dn} as the established daytime residential noise standard. Short-term construction-generated noise is normally exempt from these noise standards. Nevertheless, potential noise impacts on sensitive receptors must be evaluated.

Impacts

Upper American River. This alternative would require aggregate mining at the previous Auburn Dam site. During mining, a number of noise-generating sources would be in operation. Some of the sources would be intermittent and some constant; some sources would be stationary; others would be mobile.

Construction activities related to the railhead area would be limited to daylight hours when individuals are less likely to be disturbed. This would be an adverse effect which would be significant and unavoidable.

Major sources of noise generation would be drilling rigs and blasting, crushing, and loading and hauling equipment. Overall, noise generation could also be expected during nighttime hours due to high production rates necessitated by the construction schedule (8-year construction period).

Construction and mining activities, especially blasting and operation of heavy equipment, would create temporary noise increases near the damsite. Initially, temporarily increased noise levels can be anticipated from the development/construction and later during operation of the conveyor transport system used to move material from the processing plant to the dam face. Because they are powered by electricity, the conveyor motors would cause only minor noise impacts. Noise from these motors, however, combined with noise generated from conveyor apparatus (belts, pulleys, and rollers) and the aggregate itself as it vibrates during transport, is anticipated to increase the ambient noise levels within the canyon area immediately adjacent to the conveyor system. This does not constitute a significant impact.

Aggregate handling and processing and small stationary noise sources have lower initial noise levels, so their corresponding noise impact zones are much smaller. Noise emissions from haul trucks, compressors, and pumps are generally attenuated to acceptable levels within 500 feet of the noise source. Smaller, discrete sources such as generators and compressors are also more readily controlled with heavy-duty mufflers designed to minimize noise generation. This does not constitute a significant impact.

Construction activities at the Highway 49 replacement site and the damsite would also generate construction noise from heavy-duty equipment similar to the equipment listed in figure 7-1. However, these impacts would not be significant because these work sites are isolated, and there are few nearby noise-sensitive receptors. Construction-related traffic would be generated in the Auburn area, but until the numbers and types of transport equipment are known, the extent of noise generated by those activities cannot be determined. Consequently, construction noise impacts at the damsite and Highway 49 Bridge site would be considered short-term adverse, but less than significant.

Downstream From American River. Noise impacts would be associated with raising and strengthening the levees along the Sacramento River. Heavy-equipment noise would be the major concern during levee-related and dam construction activities. Primary sources of noise in these cases would be engine exhaust, fans, transmissions, and other mechanical equipment. These impacts would be considered short term. Because short-term construction-generated noise is normally exempt from noise standards, this would not be a significant impact.

Mitigation

Heavy-equipment and railcar or truck noise would be the major concern during levee-related and dam construction activities. Primary sources of noise in these cases are engine exhaust, fans, transmissions, and other mechanical equipment. Heavy equipment is typically

fitted with mufflers and engine enclosures to allow operation in noise-sensitive areas. Thus, the source of noise may be controlled within technological limits by requiring adequate mufflers and enclosures to be maintained on heavy equipment and other noise-producing tools.

When reasonably controlled, construction noise is often accepted by the public during daytime hours (7 a.m. to 5 p.m.). People are less tolerant of noise and may complain if nonemergency construction activities continue at night. Preventing nighttime construction near noise-sensitive receptors can effectively reduce public concerns.

The following measures, therefore, are recommended to reduce the project's short-term construction-related noise impacts on adjacent noise-sensitive land uses.

- Mufflers shall be provided for all project-related heavy construction equipment and stationary noise sources (such as diesel generators). Stationary noise sources shall be located at least 300 feet from occupied residences or contractors shall be required to provide appropriate noise-reducing engine-housing enclosures.

- Equipment warmup areas, water tanks, and equipment storage areas shall be placed in a central area as far away from existing residences as is feasible.

Aggregate production and processing at the damsite, including blasting, would create temporary noise increases near the construction site. To help reduce noise impacts to nearby residences, blasting would be limited to daytime hours. However, other processing activities would be required about 20 hours each day for the dam construction period. Thus, noise impacts associated with aggregate production would be significant and unavoidable.

Background ambient noise levels would also increase in areas adjacent to the conveyor route; however, no sensitive receptors are located near the conveyor alignment. Consequently, these impacts would remain adverse but less than significant.

Delivery at the railhead would be limited to daylight hours.

Construction-related traffic noise can be reduced at noise-sensitive receiver locations by ensuring that all traffic complies with applicable noise emission standards. Traffic routing can often be selected to minimize exposing these areas to heavy truck traffic.

Measures recommended to reduce the project's mobile source construction noise impacts are:

- All onroad mobile construction vehicles (dump trucks) shall be equipped with mufflers.

- All dump truck haul trips shall follow only the haul routes analyzed in this report unless a waiver is received from the appropriate agency.

- No dump truck haul trips shall be allowed in residential areas before 8 a.m. or after 6 p.m.

The above mobile source noise mitigation measures would reduce project-generated mobile source noise to the greatest extent feasible. Residual impacts would be considered adverse but less than significant for residential areas near the damsite.

VISUAL RESOURCES

No-Action Condition

Visual resource values in the upper American River canyon area are high. Visual resource values in areas where construction work associated with dam construction, replacement of Highway 49, and reinforcing of the Ponderosa Way Bridge are low due to existing construction disturbance from Reclamation's multipurpose dam.

Significance Criteria

For a project component to have a significant impact, the project or features of a project would change the visual quality of sensitive viewing components within the observable scene. A large number of viewers would notice a significant change to the character of an existing setting. Such changes may include a project feature significantly blocking a desirable viewing component or replacing valuable environmental resources previously regarded as a visual amenity.

Impacts

Lower American River. The lower American River area would be affected by the construction of a slurry wall in about 24 miles of existing levees. This construction would cause short-term visual disruption along the river.

Downstream From American River. Approximately 12 miles of levees on the east side of the Sacramento River between the Natomas Cross Canal and the mouth of the American River would be strengthened and raised. This would cause short-term visual disruption along the river, but is not considered to be significant because the work would be constructed mainly in rural areas.

Upper American River. In the first years of the project, the activity of heavy equipment and construction workers would be noticeable in the construction vicinity. Visual disruption would be easily sensed in construction areas. As project construction continues, the detention dam would increase in size. Completion of the dam would result in a structure 508 feet high crossing the canyon. This would result in a significant unavoidable, unmitigable impact.

The bridge and approaches for Highway 49 would be raised above the inundation zone. Associated construction activities would have temporary adverse effects to visual resources. The completed bridge would be similar to the existing Foresthill Bridge just upstream on the North Fork. This would result in a significant unavoidable, unmitigable impact.

Mitigation

Following levee work, levees would be seeded with an erosion-control mix of grasses and forbs which would offset visual effects. The dam structure and relocated highway would result in significant visual impacts which could not be feasibly mitigated to a less-than-significant-level.

WILD AND SCENIC RIVERS

NO-ACTION CONDITION

Lower American River.

The American River from Nimbus Dam to its confluence with the Sacramento River is designated a component of the California Wild and Scenic Rivers system (PRC section 5093.54 subd [e]), and also is classified as recreational (PRC section 5093.545 subd [h]). In January 1981, the Department of the Interior designated the lower reaches of the American River as a component of the National Wild and Scenic Rivers System. It was designated as a recreational river to acknowledge its unique urban recreational opportunities.

Upper American River.

In September 1992, Reclamation completed the technical inventory and recommendation phase of the Wild and Scenic River Eligibility and Preliminary Classification study conducted for its American River Water Resources Investigation. For the purposes of the Eligibility Determination, the project area was divided into three reaches: the Middle Fork American River from Oxbow Dam to the confluence with the North Fork, a 23-mile reach; the North Fork from the Colfax-Iowa Hill Bridge to the upper end of Lake Clementine, a 16-mile reach; and the North Fork from the North Fork Debris Dam to the intake of the diversion tunnel, a 5-mile reach. For a river or a section of a river to be eligible for wild and scenic status, it must be determined to be "outstandingly remarkable" based on one or more of the following criteria: scenic, recreational, geological, fish and wildlife, historical, cultural, and ecological values.

The Eligibility Determination concluded that the North and Middle Forks of the American River are unique river segments in several ways containing at least one "outstandingly remarkable value" in each of the reaches. This finding was based on the

analysis of eight resource categories by representatives from several Federal and State resource agencies. The Regional Director of the Bureau of Reclamation has concurred with this finding. This finding will be processed and submitted to Congress as a part of the American River Water Resources Investigation currently being prepared. The finding will examine the technical, economic, and practical aspects of including these segments of the American River into the Wild and Scenic Rivers System.

SIGNIFICANCE CRITERIA

Section 5093.56 of the California Wild and Scenic Rivers Act states that:

> No department or agency of the state shall assist or cooperate, whether by loan, grant, license, or otherwise, with any department of the Federal, State, or local government, in the planning or construction of any dam, reservoir, diversion, or other water impoundment facility that could have an adverse effect on the free-flowing condition and natural character of the river and segments thereof designated in Section 5093.53 as included in the system . . . .

Any adverse effect to river segments included in the Wild and Scenic Rivers system would be considered a significant impact. Additionally, effects are considered significant if the action would alter the river segment's ability to be included in the Wild and Scenic Rivers system.

IMPACTS

Lower American River.

Construction of the slurry wall in the levees along the lower American River will not diminish the "outstandingly remarkable values" which qualified this portion of the river for inclusion in the both the Federal and State Wild and Scenic Rivers Systems.

Upper American River.

The proposed damsite is downstream from the reaches evaluated in the Eligibility Determination. The material to construct the dam would be taken from the remnant cofferdam and the material deposited in the streambed during the cofferdam failure in 1986 and mined from an amphibolite quarry that would be opened specifically for the project. Construction of the dam would affect the visual character of the downstream portion of the North Fork American River reach which extends from the North Fork Debris Dam to the diversion tunnel. This could affect the suitability of this 5-mile reach to be included in the Wild and Scenic Rivers System.

Operation of the detention dam would result in the loss of approximately 1,220 acres of vegetation over the 100-year period of analysis. This loss would be the result of periodically inundating the canyon during extreme storms. As discussed earlier, there is approximately a 20 percent chance that there would be at least one project design storm during the period of analysis. The vegetative losses would be mitigated by acquiring and planting 2,774 acres of low habitat value land along the Yuba River and planting native species comparable to the vegetation in the American River canyon. This effort would commence shortly after the project is authorized. The second component of the mitigation plan is the implementation of the AMP on 1,481 acres in the areas along the river that are likely to be flooded most frequently and as a result would be most susceptible to vegetative losses. The AMP will consist of a preflood monitoring program to establish the vegetative baseline conditions. During the growing season following a storm severe enough to impound water, the flooded area would be surveyed to identify vegetative losses. The areas which had lost vegetation would be replanted with comparable native vegetation. This would ensure that the AMP area would maintain the same basic visual and vegetative character over the 100-year period of analysis. In addition to the AMP, the non-Federal project sponsors have made the commitment to restore any vegetation lost outside the AMP area as a result of even the most infrequent storm events. The replanting program conducted after every inundation cycle as part of the AMP, and the additional planting work done by the non-Federal sponsor, will assure that the vegetative cover and composition will remain virtually unchanged throughout the period of analysis. The vegetative communities that will exist in the future would be judged to possess "outstandingly remarkable values" that are eligible for inclusion in the Wild and Scenic Rivers System. The commitment to maintain the outstandingly remarkable values for canyon vegetation which were considered during the 1992 Eligibility Determination will assure that river reaches studied would also be Suitable for Inclusion in the system.

The non-Federal sponsors are also making a commitment to restore formally recognized recreation trails and access roads that are damaged during an inundation cycle. This commitment would ensure that the recreation values which were considered in the 1992 Eligibility Determination would remain unchanged after the dam is completed.

Construction and operation of the detention dam would not alter the "Outstandingly Remarkable Values" in the three American River reaches that were evaluated to determine if they were eligible for inclusion in the Wild and Scenic Rivers System. The Middle Fork American River from Oxbow Dam to the confluence and the North Fork American River from the Colfax-Iowa Hill Bridge to the upper end of Lake Clementine would both be "Suitable for Inclusion into the Wild and Scenic Rivers System." The reach from the North Fork Debris Dam to the diversion tunnel may not be suitable for inclusion as a result of constructing the detention dam. If the downstream end of the reach were moved to Tamaroo Bar (at about river mile 48), the dam would not be visible, and this shortened reach would also be suitable for inclusion.

MITIGATION

No mitigation would be required because the work along the lower American River would not alter the values which were used to include the river in the system. There would be no mitigation required for construction and operation of the detention dam, since nothing would preclude the Secretary of Interior and Congress from designating the three reaches of the upper river as suitable for inclusion in the Wild and Scenic Rivers system, providing the downstream limit were moved to Tamaroo Bar.

CUMULATIVE IMPACTS

For the purposes of this analysis, the cumulative impacts which would result from the Detention Dam Plan were assessed by listing the projects which would produce impacts similar to those which would result from this alternative along the lower American and Sacramento Rivers and their tributaries. A discussion of these cumulative impacts is contained in chapter 10.

The Detention Dam Plan would return the operation of Folsom Reservoir to the 1986 Diagram, resulting in the flood reservation being 400,000 acre-feet each year. This diagram would eliminate the need to replace water and hydropower foregone as a result of implementing the 1993 Diagram. The constraints on recreational opportunities from the slightly lower reservoir levels during the period of reoperation would be eliminated by returning the operation to the 1986 Diagram. The mitigation structures provided by SAFCA would remain in place.

GROWTH-INDUCING IMPACTS

The Detention Dam Plan was formulated to neither promote nor prohibit expansion for permanent water storage at the Auburn site. Expansion to a multipurpose dam project with a permanent pool would significantly increase vegetative losses, geomorphological changes, and related impacts over those identified for the Detention Dam Plan.

A multipurpose project could be implemented in one of two possible ways: (1) construction of a multipurpose facility independent of flood control proposals on the American River (authorized and built instead of flood-control-only facilities or at a different location from the proposed flood detention dam) or (2) expansion of a flood-control-only dam sometime in the future. The growth-inducing section of chapter 10 highlights the features required to expand a proposed flood control project to a multipurpose dam and summarizes the potential impacts of a large multipurpose dam under either method of authorization. This discussion draws heavily on the previous environmental work completed by Reclamation for the full-sized multipurpose Auburn Dam.

Flood plain development in the Sacramento area would be the same under this plan as under the No-Action Alternative.

Construction of the Detention Dam Plan would not result in an increase in the growth expected in the Auburn area under the Placer and El Dorado County general plans. Relocating Highway 49 to a higher elevation in the canyon would not shorten the time required to access the I-80 corridor to commute into Sacramento.

SUMMARY OF IMPACT CONCLUSIONS AND ENVIRONMENTAL COMMITMENTS

LAND USE

There would be no significant adverse effects on land use in the project area.

RECREATION

Impacts

Inundation of the upper American River canyon could cause trail damage due to washouts along lower-lying trail alignments or deposition of floating debris. Although minor, these individual impacts, when added together, would constitute a significant effect.

Mitigation

Limited trail repair for inspection access would be completed as part of the AMP. The non-Federal sponsor has agreed to repair other formally recognized trails. Additionally, the non-Federal sponsor has agreed to maintain the existing Highway 49 and make any necessary repairs following an inundation event.

FISHERIES

Construction and operation of the Detention Dam Plan would not result in significant adverse impacts in the canyon area.

VEGETATION AND WILDLIFE

Impacts

Based on an assessment of impacts, the following acreage, by cover type, would be lost: 1,062 acres of oak woodland, 62 acres of chaparral, 72 acres of mixed pine forest, 201 acres of nonnative grassland, and 136 acres of riparian habitat, for a total of 1,533 acres lost.

Mitigation

The compensation objective for this mitigation project is the replacement of acreage of vegetative cover types projected to be lost as a result of construction and operation of the proposed flood detention dam. To implement an adaptive management plan as mitigation, it would be necessary to manage approximately 1,481 acres of land bordering the North and Middle Fork channels. The methods to be used are described above.

To complete the mitigation required for project impacts, an additional 2,774 acres of canyonlands would be purchased adjacent to the Yuba River near Englebright Lake. These lands would be planted with appropriate native species.

ENDANGERED SPECIES

The Corps submitted a formal consultation request for the Detention Dam Plan under Section 7 of the Endangered Species Act on October 31, 1995. Accompanying the formal request was a Biological Assessment describing the anticipated adverse effects of this plan on the threatened valley elderberry longhorn beetle and mitigation proposed to compensate for the effects. Conclusion of consultation is anticipated 90 days after the October 31, 1995, date. At the end of the 90-day period, the FWS has an additional 45 days to finalize and deliver its biological opinion. Appendix K includes a final Biological Data Report.

Impacts

Operation of the detention dam could adversely affect the elderberry shrubs and beetle by temporarily inundating portions of the North and Middle Fork canyons where the host plant is found. Surveys located 210 shrubs with 2,336 stems greater than 1 inch in diameter, primarily along the Middle Fork. Of this total, beetle emergence holes were found in 73 shrubs. The inundation period is expected to be a maximum of 28 days. It is possible that 103 shrubs could be lost over the period of analysis and would result in a significant adverse impact.

Active Swainson's hawk nests could be destroyed or disturbed during construction activities along the Sacramento River under the Detention Dam Plan. Loss of nests or

disturbance to nests resulting in loss of eggs or death of young would adversely affect the Swainson's hawk.

Mitigation

Compensation for the beetle would be provided as a project feature in accordance with FWS guidelines. The study concluded that 1,143 stems greater than 1 inch in diameter would be affected. At a 3:1 ratio, 3,429 seedlings would need to be established. For an expected mortality rate estimated to be approximately 50 percent, 7,008 seedlings would be planted along the Middle Fork. Approximately 70 acres would be required for these plantings.

To avoid effects to the Swainson's hawk, the Corps would implement seasonal restrictions on construction activity according to DFG guidelines for mitigating effects on the Swainson's hawk (DFG, 1994).

WATER QUALITY

Impacts

Construction of the detention dam would require that unstable material be removed from the foundation area and either used in the concrete or disposed of in the old foundation keyway or near the Salt Creek boatramp. Construction material would be mined from the bar which was formed when the cofferdam failed in 1986 or extracted from an amphibolite mine which would be opened immediately downstream from the dam and 100 feet above the riverbed. There is a possibility that sediment from the construction site could enter the river.

Mitigation

The construction and operation of the detention dam were evaluated using the Guidelines promulgated pursuant to Section 404(b)(1) of the Clean Water Act. No special adaptation of the Section 404(b)(1) Guidelines were made relative to this evaluation. Construction of the proposed detention dam would be in full compliance with all applicable State water-quality standards. During construction of the detention dam, the river would continue to flow through the diversion tunnel and through a network of temporary interceptor dikes and ditches. This system would allow settling of sediment-laden flows from active construction sites. Additionally, typical construction requirements, including dikes, barriers, and fences, would be in place to contain any contaminants. There would be no impacts on water quality from operating the detention dam.

On the basis of the Section 404(b)(1) Guidelines, the proposed construction of the detention dam, and implementation of mitigation features to compensate for adverse impacts, is specified as complying with the requirements of these guidelines.

CULTURAL RESOURCES

Impacts

Periodic, temporary inundation of the canyon area could cause substantial site disturbance to the 180 sites.

Mitigation

Impacts from temporary inundation, including wave action, and a new zone of wet-dry cycling, could be reduced by data recovery, documentation, and structural protection, but not to a less than significant level.

TRANSPORTATION

Impacts

Relocating Highway 49 and constructing a flood detention dam near Auburn would cause periodic flooding of the existing Highway 49 along its present alignment where it crosses the North Fork of the American River.

Mitigation

The relocated Highway 49 corridor would be used for access to the confluence of the North and Middle Forks because the non-Federal sponsor has agreed to maintain the road.

AIR QUALITY

Impacts

Constructing the detention dam would produce a variety of emissions, including fugitive dust from aggregate mining and processing and emissions from equipment used to raise and strengthen the levees along the Sacramento and American Rivers, construct the dam, and relocate Highway 49. Additionally, ROG and NO_x emissions would be above threshold levels. Major construction activities in the canyon would be conducted over a 6-year period.

Mitigation

Mitigation would include preparation and implementation of a dust suppression plan and the purchase of emission offsets. An Air Quality Conformity Plan would be prepared and coordinated with the appropriate agencies in Placer, El Dorado, and Sacramento Counties.

NOISE

Impacts

This alternative would cause increases in the ambient noise levels in the vicinity of the damsite from quarry activities, foundation excavation, concrete mixing facility operation, and construction equipment noise. This is considered a significant, unavoidable impact.

Mitigation

Typical construction site mitigation for noise would be in place to avoid or reduce the increase in ambient noise levels. The construction equipment would be equipped with appropriate mufflers and stationary sources would be shielded. The increase in noise levels from construction and quarry activities would result in significant and unavoidable effect that may not be mitigated to a less than significant level.

VISUAL RESOURCES

Impacts

Construction of this alternative would result in an increase in the level of activity from building the dam and erecting the concrete batch plant. As the dam construction continues and the structure approaches its ultimate size, an imposing concrete structure would be built in this relatively natural-appearing canyon setting. Relocating Highway 49 to a higher elevation would result in the construction of a high-level bridge crossing the canyon well above the riverbed.

Mitigation

The area around the dam would be restored using native vegetation to repair construction access roadways and work areas which are not needed for operation purposes. No mitigation is anticipated which would reduce the impact of the dam and bridge to a less-than-significant level.

WILD AND SCENIC RIVERS

Impacts

Construction of the slurry wall in the levees along the lower American River would not diminish the "Outstandingly Remarkable Values" which qualified this portion of the river for inclusion in the both the Federal and State Wild and Scenic Rivers Systems. Construction and operation of the detention dam would not alter the "Outstandingly

Remarkable Values" in the three American River reaches that were evaluated to determine if they were eligible for inclusion in the Wild and Scenic Rivers System. The Middle Fork American River from Oxbow Dam to the confluence and the North Fork American River from the Colfax-Iowa Hill Bridge to the upper end of Lake Clementine would both be "Suitable for Inclusion into the Wild and Scenic Rivers System." The reach from North Fork Debris Dam to the diversion tunnel may not be suitable for inclusion as a result of constructing the detention dam. If the downstream end of the reach were moved to Tamaroo Bar (at about river mile 48) the dam would not be visible, and this shortened reach would also be suitable for inclusion.

Mitigation

For the purpose of Wild and Scenic River eligibility, the unavoidable visual impact which would result from construction of the detention dam would be mitigated by moving the limit of the downstream reach to Tamaroo Bar so the dam would not be visible. This would allow all three reaches to be designated as suitable for inclusion in the Wild and Scenic Rivers system.

SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

Unavoidable impacts which cannot be mitigated to a less-than-significant level include possible impacts to noise levels, cultural resources and impacts to the visual character of the canyon.

SIGNIFICANT IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction of the Detention Dam Plan would result in irreversibly committing aggregate and associated materials for dam concrete.

EFFECTS FOUND TO BE SIGNIFICANT

The summary tables at the beginning of this final SEIS/EIR list potential impacts and proposed mitigation.

CORPS RESPONSES TO FWS RECOMMENDATIONS

GENERAL COMMENT

The U. S. Fish and Wildlife Service (FWS) submitted a revised draft Supplemental Fish and Wildlife Coordination Act (FWCA) report for the ARWP (American River Watershed Project) in July 1995. The report supplements FWS's 1991 CAR. The entire section of FWS recommendations is presented below, with Corps responses below each recommendation.

> The recommendations contained within this section constitute what FWS believes, from a fish and wildlife resource perspective and consistent with our Mitigation Policy, to be the best present recommendations for the project. The outcomes of any new or renewed consultations, as required under Section 7 of the FESA (Federal Endangered Species Act) or the Fish and Wildlife Coordination Act, could also affect the recommendations herein. Rationales for most of the recommendations were discussed earlier within this report.
>
> The Council on Environmental Quality and FWS's Mitigation Policy define mitigation as including the following elements: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. FWS considers these elements to represent the most desirable sequence of steps in the mitigation planning process. In determining when to move from any one element to the next in the sequence, success or failure of particular techniques or approaches in the past under similar circumstances (as reflected in the results of previous mitigation evaluation studies [(e.g., DeWeese, 1994]) are taken into account. Our preferred alternative for mitigation of project impacts is to avoid them altogether. Following are our recommendations for (1) actions relative to the American River Watershed Investigation as a whole, (2) actions specific to the Stepped Release Plan, and (3) actions specific to the Corps' Detention Dam Plan.

GENERAL RECOMMENDATIONS

FWS Comment: We recommend that adverse impacts be minimized by selecting a flood control alternative which avoids unmitigable impacts to fish and wildlife resources. At present, this plan would be either increased Folsom Modification or the Stepped Release Plan.

Corps' Response: The non-Federal sponsors of the project, the Sacramento Area Flood Control Agency and the State of California Reclamation Board, in conjunction with the Corps, have thoroughly considered all the alternative plans, including the Folsom Modification Plan and the Stepped Release Plan. Based on final recommendations of governing boards and headquarters review, the project proponents have selected the

Detention Dam Plan as both the NED plan and the locally preferred plan. Regardless of the plan selected, full compensation, to the extent practicable, would be provided.

FWS Comment: The following recommendations are provided pursuant to Section 7 of the FESA.

a. Determine potential effects of the project on listed or proposed species or critical habitat, by conducting surveys for the species or potential habitat, as appropriate.

b. Should the species or critical habitat be present, complete a Biological Assessment for the project and determine whether the species would be affected.

c. Should the proposed action be likely to affect the species or its critical habitat, initiate formal consultation with FWS.

Corps' Response: The Corps has initiated formal Section 7 consultation by forwarding a Biological Assessment to FWS. Recommendations that would reduce the likelihood of listed species being adversely affected by the project are also included in the Corps' Biological Data Report (appendix K).

DETENTION DAM PLAN

FWS General Comment

Our current recommendations relative to this alternative are similar to those presented in 1991, with changes that reflect (1) focus on the previous NED Plan rather than the smaller Equivalent Storage Plan dam, (2) authorization of Natomas levee construction, (3) findings of the WLRC on the Auburn HEP in 1992, and (4) our recent mitigation assessment (appendix F). As discussed earlier, we do not believe there are sufficient suitable lands available in the ecoregion to mitigate the impacts of either the Equivalent Storage Plan or the Detention Dam Plan.

FWS Comment: To assure adequate evaluation of impacts to fish and wildlife of any future expansion of a flood-control-only dam at Auburn, the authorizing document for the Detention Dam Plan include a statement that any alteration of flood-control-only facilities or project purpose be authorized by additional legislation, and that biological impact analyses of a permanent storage facility be completed prior to such authorization. Include, in all environmental documentation, all cumulative impacts of conversion to a water supply reservoir.

Corps' Response: The detention dam would be designed to neither impede nor facilitate subsequent expansion of the facility into a multipurpose project providing permanent water storage and related water supply, hydropower, flatwater recreation, and instream flow benefits. Such an expansion would require separate Congressional action based on

appropriate environmental review of the impacts of permanent water storage in the project area. An evaluation of the cumulative impacts which could result from the incremental effects of expanding the detention dam into a multipurpose facility providing permanent water storage is included in chapter 10.

FWS Comment: To compensate the loss of 2,360 acres of riverine canyon and upland wildlife habitat due to direct project-induced impacts in the American River canyon, acquire and manage 11,560 acres for fish and wildlife in an area suitable for revegetation of all lost habitat types.

Corps' Response: The analysis conducted by the Corps, SAFCA, and the State determined that approximately 1,533 acres of oak woodland, mixed pine forest, chaparral, and riverine habitats would be lost over the life of the project as a result of constructing and operating the detention dam and relocating Highway 49. A total of 1,481 acres along the canyon bottom would be managed according to an adaptive management plan, and 2,774 acres along the Yuba River near Englebright Lake would be purchased and planted with appropriate species. Mitigation plantings would be at a density of 350 trees and 150 shrubs per acre for oak woodlands; 130 trees and 150 shrubs per acre for mixed pine forest; 40 trees and 100 shrubs per acre for riparian; and 260 shrubs per acre for chaparral areas. This would also include plantings for lost habitat of the threatened valley elderberry longhorn beetle in the AMP area.

FWS Comment: Mitigate for fish habitat losses by placement of log barriers, downfall trees, and rock gabions to create pools and instream cover, and by stabilization and revegetation of slipouts and removal of sediment resulting from sloughing of canyon walls.

Corps' Response: The Corps does not agree with this recommendation. Operation of the detention dam would not alter the available fisheries habitat in the American River canyon. The increased capacity of the outlet sluices has eliminated ponding in the basin from storms less than a 20-year return frequency, and the use of operational gates to control the release rate for larger storms would eliminate the drawdown-induced sloughing. As noted above, the impacts to vegetation from inundation mortality would be mitigated using the adaptive management plan approach.

An ancillary benefit of the adaptive management plan is that storm damage to recreational trails and roadways leading to the river would be repaired to assure continued access to recreational facilities and mitigation planting areas. This would stabilize the trail and road cuts, reducing the likelihood of a slide during subsequent events.

FWS Comment: To mitigate increased sedimentation and resultant stream habitat degradation in the lowest elevation zone (490-800 feet), stream habitat be improved above Lake Clementine and above streambed elevation 800 feet in the Middle Fork. Preparation of a long-term fishery management plan in consultation with the DFG and FWS would be needed prior to any revegetation efforts, or efforts associated with Recommendation 3, above.

Corps' Response: The Corps does not agree with this recommendation. See the response above. The lands adjacent to the river are the lands which would be managed with the adaptive management plan. The details of the adaptive management plan would be closely coordinated with FWS and DFG prior to implementation.

FWS Comment: To minimize any additional impacts to the remaining wildlife lands in the project inundation zone, a wildlife management plan be developed cooperatively by DFG and FWS, and the Corps, and implemented throughout the project life.

Corps' Response: The Corps, SAFCA, and the State would work closely with FWS and DFG to assure that impacts to wildlife in the inundation zone are minimized.

FWS Comment: To mitigate the impact of canyon wall sloughing and resultant river sedimentation, slipouts be stabilized by revegetating with indigenous species, sediment be removed from the channel, and the streambed be recontoured to normal gradient. Work should be done promptly after sloughing. Planning and implementation of slipout repair should be coordinated with FWS and DFG.

Corps' Response: The Corps does not agree with this recommendation. Operation of the sluice gates would control the drawdown rate from the dam. This would virtually eliminate drawdown-induced sloughing. To minimize direct impacts from sedimentation and incidental spillage during construction, temporary measures should be implemented to divert natural streamflows from the active construction sites. This would make construction easier in the dewatered channel and would minimize contact of potentially harmful materials with the river. Installing a network of temporary interceptor dikes and ditches at construction sites would convey sediment-laden flows into temporary settling basins, and the clarified water would be discharged to the river.

FWS Comment: Develop detailed mitigation, monitoring, and remedial action plans for each mitigation action and site. Coordinate all phases of mitigation plan development and implementation with FWS and DFG.

Corps' Response: A mitigation and monitoring program would be further developed by the Corps, SAFCA, and the State upon project authorization. A draft plan is included in appendix H.

FWS Comment: Address any impacts to Federal and State-listed and candidate species resulting from project-induced agricultural or urban development within the appropriate environmental documentation for this project. Initiate the appropriate consultation with FWS, as required under the FESA, for such potential effects on listed species.

Corps' Response: The Corps has initiated the process required by Section 7 the FESA by submission of the Corps' Biological Assessment to FWS. Although there would be no project-induced development, the Corps would address all potential direct, indirect, project-induced growth, and cumulative impacts in chapter 10.